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Navy Department - Office of Research and Inventions

NAVAL RESEARCH LABORATORY
Washington, D.C.

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SHIP-SHORE RADIO DIVISION - RECEIVER SECTION

19 August 1946

TEST OF MODEL RDZ-1
RADIO RECEIVING EQUIPMENT

By W. E. W. Howe

Report R-2929

RESTRICTED

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ABSTRACT

The Model RDZ-1 receiver is designed for ten-channel, crystal-controlled communication in the frequency range from 200 to 400 megacycles. It was manufactured by the Admiral Corporation, Chicago, Illinois, under contract NXsr-7194. The equipment is intended to be electrically and mechanically identical to the Model RDZ receivers, furnished under contract NXsr-55624 by the National Company, Inc., Malden, Massachusetts.

Acceptability tests were conducted at the Laboratory to determine whether the performance and mechanical construction of the Model RDZ-1 receiver compared favorably with that of the Model RDZ. Authorization for these tests is contained in reference (a). The governing specifications are outlined in reference (e). No complete tests have been conducted at the Laboratory on a production Model RDZ manufactured by the National Company. The preproduction model of this receiver, designated as the Model CXHY, was subjected to type tests, and results are to be found in reference (f). This preproduction model is, however, representative of a production unit in many respects.

The tests of two Model RDZ-1 receivers revealed that electrical performance is generally equal to that of the CXHY. The r-f gain control characteristics were found to be satisfactory after both it and the silencer control were interchanged. The a-f leakage in the silencer circuits was reduced at the Laboratory by a minor change in the wiring of these circuits. The only other serious electrical defect was excessive loss of gain during vibration tests and at elevated temperatures. The majority of mechanical defects have been outlined previously in conference (references (b) and (c)), and their correction is recommended.

The manufacturer has succeeded in producing a unit which is very similar to its prototype model RDZ. If careful attention is given to the correction of defects outlined herein, performance of the RDZ-1 in shipboard service should be equal to that provided by the RDZ.

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RESULTS OF ELECTRICAL TESTS

1. As far as possible, tests of the Model RDZ-1 were conducted under the same conditions as employed for the Model CXHY described in reference (f). For all electrical tests, unless otherwise specified, the RDZ-1, Serial 1, receiver was used. No realignment of the i-f or r-f stages was attempted; the receivers were left in the condition in which they arrived at the Laboratory unless otherwise indicated herein.

2. Receiver sensitivity was measured employing the same substitution method as described in reference (f), in order to eliminate errors due to frequency modulation in the signal generator. Results and measurement details are shown in Plate 1. The final adjustment of the receiver, as with the CXHY, was made by tuning the receiver for maximum signal regardless of crystal multiplier current. It was possible on some channels to thus obtain a considerable improvement in sensitivity from that obtained by peaking on multiplier current. This improvement was from between 0 to 13 decibels in the range from 233 to 387 megacycles. The effect was particularly noticeable above 380 and below 250 megacycles, and probably is an indication of r-f tracking error. It should be strongly emphasized in the instruction book that final adjustment of the receiver should be made tuning for maximum noise or resonant signal output rather than for maximum multiplier current as indicated on the tuning meter. This procedure is not adequately stressed in reference (i), but it is understood that additions are being made in the final version.

3. In the range between 240 and 390 megacycles, the sensitivity varied between 9.4 and 2.7 microvolts, with an average value of approximately 6 microvolts. Beyond this range the sensitivity becomes poorer, but is within the limits required in reference (e), except from 234 megacycles to the edge of the blocked area at approximately 230 Mc. Below the blocked area, results were not as satisfactory, and some crystals did not oscillate at all below 205 Mc (channel frequency). There are no specification requirements below 225 Mc, and evidently no concern is being felt for this range.

4. It is felt that this performance meets the intent of the specification, which was written in view of performance of a specific CXHY equipment. Reserve gain measurements were made on the basis of the increase in noise level over standard sensitivity noise output as obtained by advancing the a-f gain control to maximum. Variation in reserve gain was between 8.5 and 13 decibels with "narrow" a-f bandwidth, which provides an adequate amount at all frequencies.

5. Video sensitivity was measured using the same substitution method as was employed to measure sensitivity at the audio output. Results of these measurements are shown in Plate 2. These measurements indicate the sensitivity in the useful range to be between 6.2 and 30 microvolts. The average value is approximately 12 microvolts. This meets the specified requirements and is as good or better than CXHY performance. Video reserve gain at the frequencies measured always exceeded 11 decibels, which is considered adequate.

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6. Sensitivity at the r-f scanning (or panoramic) output terminals was measured, using a ten-microvolt signal at the i-f of 15.1 megacycles as the reference output. A 1200-ohm decoupler was used between the scanning output load (50 ohms and 0.01 microfarads in series) and the RBC receiver used as an indicating voltmeter. The results of these measurements are shown in Plate 3. At frequencies above the blocked area sensitivity varied between 15 and 115 microvolts. The average sensitivity over the useful range is approximately 30 microvolts. As previously mentioned, sensitivity at frequencies under 220 megacycles is not as good. The scanning sensitivity meets the requirements of reference (e) and exceeds performance of the CXHY.

7. The injection of intermediate-frequency voltage from the crystal multiplier system into the i-f amplifier renders a sizeable portion of the frequency range of the RDZ-1 useless. As with the RDZ, the third crystal harmonic is responsible. In Plate 4, a graph is shown of input meter readings due to this injection as a function of frequency. The measurements were made by utilizing crystals in the receiver having the fundamental frequencies indicated on the curve. The preselector was tuned to correspondi channel frequencies, and the corresponding input meter readings were recorded A small error in the actual frequency recordings may be present due to not heating the crystal oven during the measurements.

8. Equivalent signal input for this data can be obtained from Plate 5. The maximum injection of crystal harmonic energy into the i-f amplifier is equal to a signal of approximately 10,000 microvolts at the worst frequency. The maximum range in which such energy was detectable was from 221.2 to 231.1 megacycles approximately. When such energy becomes detectable the receiver gain falls extremely rapidly. By the time an input meter reading of 0.05 ma due to this injection is obtained, the gain of the receiver has decreased at least 6 decibels. The rate of decrease in gain at the edge of this blocked area is extremely rapid. Once the energy becomes detectable on the tuning meter, the receiver is virtually useless for communications. This defect is one of the most serious in the RDZ and RDZ-1 equipments. However, the RDZ-1 receiver is similar to the CXHY in this respect and meets the intent of the specifications. The frequency range below 235 megacycles is apparently not considered important in these equipments.

9. Plate 5 is a calibration of the input meter in terms of signal input to the i-f amplifier. This calibration will be similar on an overall basis in the useful range of the receiver, where the voltage amplification of the preselector is within 10 decibels of unity. Greater accuracy of measurement could be obtained by using signal generators at the intermediate frequency rather than at the signal input frequencies.

10. Measurements of spurious responses were made at a channel frequency of 371 megacycles. The serious nature of the spurious response characteristics has been stressed in reference (f). A characteristic tabulation of data is shown in Plate 6, demonstrating the customary multitude of such responses with less than 100 db of rejection. No response due to signal generator harmonics has been included with this data. All these responses were within the specified limit, except that at 378 megacycles, which was 1.1 db excessi Measurements were made using diode current indication with an unmodulated signal to lessen errors due to frequency-modulation in the signal generator.

Performance of the Model RDZ-1 in respect to spurious responses is far from satisfactory for shipboard equipment, but it is very similar to that obtained with the Model CXHY.

11. Measurements of one of these responses, the primary image, were made at various channel frequencies, and the results of such measurements are shown in Plate 7. Image rejection always exceeds 52.5 db until a frequency of 377 megacycles is reached. At the high frequency end of the receiver coverage, rejection rapidly decreases and just meets the specifications. Performance is fairly similar to the CXHY in this respect.

12. Plate 8 shows the scanning channel selectivity at a frequency of 301 megacycles. This measurement was made using a Navy Model RBC receiver across the specified scanning output load through a 1200-ohm decoupling resistor. A reference output level was established on the RBC receiver for the resonant intermediate frequency by applying a signal from the LAF signal generator at the antenna terminal of the RDZ-1 at its resonant frequency. The RBC was then tuned to frequencies off the resonant intermediate frequency, and the attenuation ratio was computed from the readings obtained by tuning and adjusting the output level of the LAF signal generator. This signal generator was adjusted to produce the reference level output established at the resonant intermediate frequency. Unmodulated c-w signals were used for this measurement, and none of the RDZ-1 receiver controls appreciably affected the measurement.

13. The scanning channel bandwidth at the 6 db point measured 900 kilocycles; at the 60 db point, it measured 8850 kilocycles, giving a selectivity ratio (60/6 db) of 9.8. This data is almost identical with that shown in reference (f), and the performance meets the requirements of reference (e).

14. Selectivity characteristics of the intermediate-frequency amplifier were measured without any realignment. Measurements were made over a range of r-f gain control adjustment of more than 60 db. Data with narrow selectivity is shown in Plate 9. The 6 db bandwidth was between 115.9 and 120 kilocycles and that at 60 db was between 350 and 370 kilocycles. Reference (e) sets as limits 115 to 135 kilocycles and 325 to 425 over the gain range shown. The 60/6 db bandwidth ratio is approximately 3, which is satisfactory.

15. A slight tendency towards regeneration with maximum r-f gain is indicated in Plate 10 (broad i-f selectivity) but no appreciable effect on operation was noted. With the data presented as shown in Plate 10, the specifications are met with all gain control positions. The bandwidth at the 6 db point measured 247 to 253.4 kc over the gain range shown. The specification permits a variation from 230 to 270 kc. The 60 db bandwidth is 500 to 520 kilocycles, well inside the specification requirement of 475 to 575 kilocycles. The 60/6 db bandwidth ratio is approximately 2.

16. The audio frequency response of the receiver between i-f input and audio channel output meets the specification requirements, and is shown in Plate 11. The bandwidths measured are shown below, together with the specification requirements:

Attenuation Band-pass-cycles per second

DECIBELS	BROAD (MEASURED)	BROAD (SPECIFIED)	NARROW (MEASURED)	NARROW (SPECIFIED)
2	205-4200	———	375-3100	400-2000
4	150-9000	200-4000	340-3700	———
6	125-11500	125-7000	320-4100	350-3500

This is satisfactory performance.

17. The 23 db band-pass with the audio filter narrow is between 250 and 5300 cps, which is within the maximum limits of 200 and 6000 cps stipulated in reference (e) at this level. The insertion loss of the filter is 2 db, which is within the specified limit of 3 db.

18. Video fidelity of the model RDZ-1 receiver is shown in Plate 12. Response is flat within 6 decibels from 26 to 96,000 cps, which compares with CXHY response from 25 to 90,000 cps. This meets the specifications except for the high frequency limit of 100,000 cps required. This fidelity is, however, considered satisfactory.

19. Audio channel resonant overload characteristics with the silencer and AVC off are shown in Plates 13 and 14. These measurements were made by injecting an i-f signal input into the intermediate frequency amplifier (across R-115 in the 6F4 mixer (V-107) grid circuit through a 0.01 microfarad condenser). A Measurements Corporation Model 65B signal generator, modulated 30 percent at 1000 cps, was used as a signal source. The characteristic with AVC off is somewhat superior to that shown in reference (f). These measurements were made with the audio filter narrow, the i-f selectivity broad and a Ballantine vacuum-tube voltmeter across the 600 ohm non-inductive output load. The measurements were made at the intermediate frequency to avoid errors due to frequency-modulation in the signal generators in the frequency range from 200 to 400 megacycles.

20. Audio Channel resonant overload characteristics with AVC on are shown in Plates 15 and 16. Beyond the overload point up to inputs of one volt, there is a gradual decrease in output. With an input of 100,000 microvolts (audio gain reduced) the output is down only 2 decibels. A further dip was observed around 1.0 volt of about 6 decibels. The characteristic is considered satisfactory, and performance fulfills the requirements of reference (e).

21. Silencer action with the receiver as it arrived at the Laboratory is shown in Plate 16, for several settings of this control. The curve for 13 percent of the silencer control rotation is indicative of performance with the silencer set to just silence receiver noise with no signal present. The measurements were made through the i-f amplifier (see paragraph 19). The leakage of the signal is somewhat excessive with the silencer operating. In order to comply with the requirements of reference (e), this leakage should be more than 30 db below the output level without silencing. The attentuation shown in Plate 16 is only about 28 decibels.

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22. The same defect was also found in an early production model RDZ (serial 5) available at the Laboratory. Investigation disclosed that the green lead from coupling capacitor C-250 to pin 4 on tube socket X-211 is laced into a cable common with numerous other leads for a portion of its length. This lead runs from the 0.01 microfarad coupling condenser at the output of the silencer diode to the control grid of the 6AB7 second audio amplifier. To reduce the leakage, this lead was removed from the cable and was run directly through the space between the bottom of the terminal strip and the top of bathtub capacitor C-251. This more direct path to the 6AB7 reduced the lead length by approximately three inches.

23. Silencer characteristics after the wiring was revised are shown in Plate 17. A reduction in leakage of at least 6 db has thus been obtained. Requirements of reference (e) and the proposed revisions of reference (d) are both fulfilled. As recommended in reference (c), the National Company, Inc., submitted ten sets of representative silencer curves of the Model RDZ. These curves seem satisfactory. Since both requirements of reference (d) and reference (e) can be fulfilled with the present silencer circuit, it is recommended that the more strict original requirements, stipulated in reference (e), be employed as specifications for both RDZ and RDZ-1 silencers.

24. As mentioned in reference (c), the RF gain and silencer controls had been inadvertently interchanged in the RDZ-1 receivers tested at the Laboratory. The characteristic shown in Plate 16 is with the controls as originally connected. That in Plate 17 is with the proper silencer potentiometer connected; the improvement is evident. This can be more clearly seen from the data in Plate 18, showing the control characteristics before and after the interchange of controls. As desired, the proper silencer control does not immediately become operative, and in its useful range action is quite linear.

25. The RF gain control attenuation characteristic was measured using signals injected into the i-f amplifier in the usual manner. An unmodulated signal was used and the output was read by the diode current indication mentioned previously with AVC off. (The RF gain control is not operative with AVC on). The measurement of this characteristic through the i-f amplifier instead of overall is indicative of actual operation, since the RF gain control affects the IF amplifier only and is not connected to the preselector circuits. The characteristic shown in Plate 19 is unsatisfactory; that in Plate 20 is acceptable. The maximum variation from linearity of the proper control from the ends to the cross-over point of the tapers is 4 decibels, which is well within the 10 db requirement. The control is required to give only 50 db plus or minus 10 db of attentuation for the initial 50 percent of control rotation. Measurements indicate 60.6 db of attentuation, which is close enough to the specifications. Total range of the control is 148 decibels. Performance can be considered satisfactory if care is taken to connect the proper potentiometer in the circuit.

26. The characteristics of the audio gain control are shown in Plate 21. Total range of this control in its 280 degrees of rotation is 57.5 db. Deviation from linearity for 50 db range is 10 db, which is within the 12 db limit established in reference (e). Performance is similar to that shown in reference (f) for the model CXHY.

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27. The phone level control characteristics are shown in Plate 22. Total range of this control in its 270 degrees of rotation is 38 db. The control action is not linear. Both the range and taper appear to be adequate for the purpose intended.

28. Output load characteristics were measured at the audio output receptacle at the rear of the receiver, as were all other audio channel measurements unless otherwise stated. The output load characteristics are shown in Plate 23, and performance meets the specification requirements. Output voltage is down only 20 percent at 30 ohms as compared to 600 ohms. Output power is flat within 3 db from 1.4 to 45 ohms.

29. The output hum level was measured with all possible receiver control adjustments and with the remote control unit connected and disconnected. A Ballantine vacuum-tube voltmeter or a General Radio Wave Analyzer was used as an indicator. The maximum hum measured with no signal present across a 600-ohm non-inductive output load was 0.027 volts or 1.2 microwatts. This is within the 2.0 microwatt limit established in reference (e), and is superior to that obtained with the model CXHY. The hum is, however, excessive on the usual basis of a 0.4 microwatt maximum. This is the limit which has been usually specified for shipboard receivers used on the lower communication frequencies.

30. With AVC on, and with unmodulated CW signal inputs of from 1000 microvolts to 2 volts introduced into the i-f amplifier, the hum level is 39.7 db down from that output caused by a 10,000 microvolt signal modulated 30% at 1000 cps. For ordinary inexpensive broadcast receivers the average level is approximately -40 db, and for a more expensive receiver it is as much as -50 db. The level stipulated in reference (e) is -40 db. Although the RDZ-1 hum performance is not good according to broadcast standards or as compared to the Navy model RBC, it is, nevertheless, superior to that obtained with the CXHY, and is very close to the specification requirement.

31. Distortion at the audio channel output terminals was measured under several conditions. For all these measurements, the signal was introduced into the i-f amplifier, to avoid errors caused by frequency-modulation of amplitude-modulated signal generators in the 200 to 400 megacycle range. Distortion was taken as the percentage ratio of the square-root of the sum of the squares of the harmonic output voltages to the output voltage at the fundamental input modulation frequency.

32. Plate 24 shows audio distortion as a function of output level with a constant input and constant modulation percentage. Maximum undistorted power output, as defined in reference (e) (7% distortion), is reached with 8.05 volts output across 600 ohms, or 108 milliwatts under these conditions. This meetsthe requirements of reference (e).

33. Distortion as a function of input voltage is shown in Plate 25. With AVC on, distortion is less than 5 percent with inputs up to 75,000 microvolts, and less than 10 percent with inputs up to 0.35 volts. With AVC inoperative, the distortion exceeds 10 percent with inputs greater than

180 microvolts. This performance is equal or superior to that described in reference (f). The distortion figure with AVC on might be lower if satisfactory measurements were possible on an overall basis, since the RF amplifier tube in the preselector is on AVC control. This tube is omitted from the measurements when the signal is introduced at the intermediate frequency.

34. Measurements of distortion as a function of modulation depth show the threshold of action and the effectiveness of the noise-peak limiter. Plate 26 shows the characteristic with AVC "on", indicating that the threshold of limiter operation was correctly set at about 45 percent modulation. Distortion with the limiter on is under 10 percent with modulation percentages of 54 or less. With the noise limiter out of the circuit, distortion is under 10 percent with modulation percentages of 82 or less, under the conditions described in Plate 26. The data shown in Plate 27 is with AVC "off". The results shown are almost identical to those shown in reference (f).

35. The operation of the noise-peak limiter is satisfactory. It provides excellent suppression of noise peaks such as are due to ignition noise and pulse transmitters. The insertion loss of the limiter measured with both AVC on and off is 1.5 decibels. This was measured with a 1000-microvolt signal input to the i-f amplifier modulated 30 percent at 1000 cps, and with the audio output level adjusted for 1.9 volts output in a 600-ohm resistive load with the limiter off. Performance of the limiter meets the requirements of reference (e).

36. As mentioned in reference (c), several other characteristics which were measured on the CXHY were not considered necessary to check with the RDZ-1 receiver. Measurements outlined in reference (f), paragraphs 8, 9, 20, 24, 32, 37, 42-45, 47, 48, 56 and 57, were not checked on the Admiral RDZ-1.

37. The oscillator radiation, as measured at the final multiplier frequency, is shown in Plate 28. The NRL radiation matching transformer used for VHF/UHF measurements was employed. Radiation from other crystal harmonics than those used for desired heterodyne action could also be detected in this frequency range, but these other harmonics did not generally appear with amplitudes as large as those at the frequencies indicated in Plate 28. Measurements of lower frequency harmonics near the fundamental of the crystal were not made, since it is very unlikely that they will radiate effectively from the RDZ-1 antenna. The oscillator radiation falls within the limits prescribed in reference (e). The usual tendency for increase in radiation with receiver frequency is somewhat in evidence, and lower radiation in the vicinity of the blocked area of reception is indicated.

SHOCK AND VIBRATION TESTS

38. The RDZ-1, Serial 20, receiver was subjected to shock and vibration tests in accordance with reference (h). These tests were conducted by the Shock and Vibration Section and results are summarized in references (g), (b), and (c). A summary of defects and failures encountered during the course of the tests is given below. The resonant frequency of the equipment with the four Barry shock mounts provided with the receiver was between

26 and 32 cps, dependent upon the direction of vibration. The mounts are therefore considered satisfactory by the Shock and Vibration Section.

39. Several screws loosened and fell out of their places during vibration tests. The 6SN7W silencer tube, V-210, failed during these tests. It is interesting to note that this was the only "ruggedized" tube in the receiver.

40. During the second phase of the shock tests, with the hammer blows applied from the rear of the receiver, the left side chassis-lock blocks loosened, releasing this side of the chassis, and bending the turned edge of the front panel at these positions. During the initial panel inspection of the receiver, however, it was difficult to lock the chassis in place, which appeared to be due to improper adjustment of the wedge screws at the rear of the chassis.

41. During inspection after completion of the shock tests, a thin crack about two inches long was observed on the main front panel centered on the lower right-hand corner of the preselector projection.

42. The most serious defect encountered during the shock and vibration tests was loss in overall gain. Gain change during all tests was measured on an overall basis with a General Radio type 804-B signal generator. The measurements were taken on a carrier channel frequency of 328.2 Mc. During vibration, the loss was gradual, the total amount being 14.5 decibels below the initial gain. Negligible change was recorded during the shock tests; actually, gain increased 2 decibels from the previous -14.5 db level. Inspection described in reference (c) did not reveal the cause of the loss, although the following additional defects were observed:

(a) The spring member of the autotone drive link had jumped from its channel, but operation was satisfactory after realignment.

(b) Some free play was observed between the upper and lower tuning condenser gangs.

(c) The inductance trimmer on the fourth multiplier tank was loose and required re-adjustment. However, after this adjustment and tube substitutions as well as manual re-tuning, the gain was still 10.5 db below the initial level before shock and vibration tests.

43. The reasons for the loss in gain due to vibration are more fully outlined in reference (b). During further alignment of the receiver, it was found that the secondary slug trimmer in the last i-f transformer needed adjustment (about four full turns). The spring tension on the adjusting screw was extremely loose, and apparently the screw had turned during vibration.

44. During final realignment of the i-f amplifier, it was found necessary to use a somewhat different procedure from that outlined in the RDZ preliminary instruction book to obtain the desired characteristic. All the

variable-bandwidth transformers required trimming to a slightly lower frequency than that given in the instruction book as a fixed-bandwidth trimming frequency. Alignment had not been checked, and i-f characteristics of this receiver were not measured prior to the shock and vibration tests.

45. After realignment of receiver Serial 20, including the preselector circuits, the i-f selectivity and overall sensitivity were found to be almost identical with those of the RDZ-1, serial number 1. The preselector circuits were aligned as specified in the RDZ preliminary instruction book. After alignment RDZ-1, Serial 20, was subjected to temperature tests.

TEMPERATURE AND HUMIDITY TESTS

46. Measurements of oscillator frequency stability of the RDZ-1 during temperature and humidity variation were not made, since measurements of the frequency controlling crystals in their oven had already been conducted. Overall gain variation was, however, measured during both temperature and humidity variations.

47. The effects of humidity variation were measured on both RDZ-1 receivers serials 1 and 20. Data was recorded at both 234 and 387 megacycles. Two characteristic examples of this data are shown in Plate 29. The maximum gain variation which could be attributed to humidity effects was approximately 2 decibels. Each receiver was also subjected to 17 and 64 hours at over 90 percent humidity and over 30 degrees Centigrade in a non-operating condition. No damage or further loss in gain was detected.

48. Measurements in most cases were made with the i-f selectivity both "sharp" and "broad". With the exception of the one failure described below, results in the two selectivity positions were within one or two decibels. After the second temperature cycle, which is the first curve shown in Plate 30, the i-f amplifier in the serial 20 receiver failed to pass any signals when the selectivity switch was thrown to the "sharp" position. This failure was observed after approximately four hours at 50 degrees Centigrade. Investigation revealed that the sliding contacts in one of the i-f transformers were defective. The contact at fault was in the forward section (as seen from the front of the receiver) in the rear variable bandwidth transformer, Z-102. This transformer provides the variable coupling between the second and third i-f amplifier stages.

49. The rotary arm had become distorted and was no longer making contact. After the arm was pressed back to its former position, no further failures were observed during the temperature and humidity tests. These contacts are designed along similar lines to those employed in "Oak" wafer switches, and it has been felt that they should prove to be satisfactory in naval service. Consideration should be given to better assembly and inspection of these wiping contact systems in production.

50. Gain variations of the serial 20 RDZ-1 at 387 megacycles during variations in ambient temperatures from -20 to +50 degrees centigrade are shown in Plate 30. The two runs shown indicate that the variation on the high frequency end of the band is well within the requirements of reference (e).

51. The first series of measurements taken in the lower frequency portion of receiver coverage is shown in Plate 31. The first gain curve indicates variation due to temperature changes from -20 to +50 degrees Centigrade. The other gain curve indicates change due to raising the ambient temperature from +25 to +50 degrees Centigrade. Another curve similar to the first one was later plotted from additional data on the same receiver and showed a gain decrease of 13 decibels.

52. Re-tuning the receiver manually from the front would not restore the sensitivity more than 2 decibels at the most. As can be seen from the curves, the greater part of the gain change occurs at the higher temperatures. The loss in gain is excessive, and performance does not meet the specifications. As the receiver cooled, it would invariably begin to recover its initial gain, as can be seen in the second curve of Plate 31.

53. Gain change due to temperature changes at a frequency of 250 megacycles was even worse. The curves shown in Plate 32 indicate a loss of 12.6 decibels with a temperature increase from+26 to +50 degrees Centigrade. The loss is gradual due to the time required to raise the temperature in the preselector compartment by heating the exterior of the equipment. These losses were measured on a basis of signal input for constant audio output (AVC off). On a variable output basis with AVC off, the loss measured with constant input would be even greater, as can be seen from the resonant overload data in Plate 14. This results from the linearity characteristics of the second detector at low impressed i-f voltages.

54. The RDZ-1, Serial 1, receiver was also subjected to temperature tests. No realignment of this receiver had been undertaken since its arrival at the Laboratory. Performance under the same conditions at 234 megacycles was similar to that obtained with the Serial 20 receiver. The data is shown in Plate 33. Loss in gain from room temperature to +50 degrees Centigrade was 9.0 decibels.

55. The cause of this excessive gain change was readily traced to the tuning condenser assembly, particularly to the rather critical tuned circuit in the grid of the mixer stage. With the shield plates removed from the preselector circuits, the RDZ-1 Serial 1, was realigned for maximum sensitivity at 250 megacycles at room temperature. It was then placed in the temperature-controlled chamber with the receiver chassis withdrawn from the cabinet. With the equipment thus exposed, it required only one hour at 60 degrees Centigrade to produce a loss in gain of 16.4 decibels as compared to that at room temperature.

56. Further investigation of these changes was made by use of a small hot-air blower. The components critical to temperature increase were thus easily discovered. The r-f circuit tuning capacitors did not appear to be at all critical to temperature increase. However, the condenser section used for tuning the mixer grid and last multiplier was extremely critical. Whenever hot air was applied to this section, the gain immediately decreased, and when it cooled, the gain was immediately restored. It was also discovered that the mixer grid capacitor was far more critical than that in the last multiplier tank.

57. It was established that the capacity of both the mixer grid and last multiplier condensers increased with an increase in temperature. Tests were then made on an RDZ tuning condenser alone, using a sample from the equipment spares. Both the laboratory measurements and measurements made by the Radio Condenser Company confirm that these condensers have a small but definite positive temperature coefficient.

58. Variations of a small order, several tenths of a micro-microfarad can be serious, considering that the maximum tank capacity is only 40 micro-microfarads. This change is, however, not as serious in the relatively broad-band antenna and r-f amplifier grid tanks as in the mixer grid tank. Only through the low frequency portion of the mixer tank circuit range is the tuning sufficiently critical to produce serious loss in gain as a result of this capacitance variation.

59. It was deduced that in alignment by the manufacturer the mixer tank inductors had been trimmed slightly on the low-frequency side of resonance. By shifting this alignment at the frequency most critical to temperature increases so that the inductors were trimmed slightly on the high-frequency side; it was possible to materially reduce the loss in gain. The adjustment was made with the receiver stabilized at normal room temperature. (approximately 25°C)

60. In the case of RDZ-1, Serial No. 20, it was possible to so align the receiver. In this receiver the inductance trimmer had initially been set about 20 degrees from the minimum inductance position, which provided just sufficient range to provide the desired alignment. In the RDZ-1, Serial No. 1, the mixer trimmer was already set at minimum inductance. It was therefore necessary to insert an auxiliary absorption loop as described in Plate 38.

61. The loss in gain with a fixed amount of heat-blast directed at the mixer tuning condenser was compared with the revised alignment and that initially made by the manufacturer. The data on the RDZ-1, Serial 1, is shown in Plate 34. With the revised alignment, loss due to heating remained less than 4 db at all frequencies above 215 megacycles. The realignment did not appreciably affect the sensitivity in the range from 230 to 390 megacycles.

62. The improvement in performance at high temperatures after the revised alignment of model RDZ-1, Serial 20, can be seen in Plate 35. Similar results were obtained to these with serial 1.

63. In Plate 36, gain variation of the RDZ-1, Serial 1, (after the revised alignment) at 268 megacycles during temperature cycling is shown. This was one of the worst frequencies in respect to gain change due to temperature increase, as shown in Plate 34. The data in Plate 36 indicates a total variation of 6.2 decibels, which virtually meets the most rigorous gain requirements of reference (e).

64. In Plate 37, performance of the same receiver at 234 megacycles, after the revised alignment procedure, is shown. This can be compared with similar data before compensating alignment was attempted, shown in Plate 33. The improvement is gain stability is 8 decibels.

65. Less detailed checks at the Laboratory indicate that this defect is common to both RDZ and RDZ-1 receivers. This defect was not observed or described in reference (f), since temperature measurements on the low-frequency end with the CXHY were taken at 220 megacycles. The gain change due to temperature rise is most striking above the blocked area, as indicated in Plate 34.

66. The following is the proposed alignment procedure for all RDZ and RDZ-1 receivers:

(a) Check the alignment of the receiver carefully in accordance with the procedure outlined in the instruction book.

(b) Remove the shield plates from the last multiplier-mixer compartment. Determine by inspection the setting of the mixer inductance trimmer. If this trimmer is at minimum inductance setting as shown in Plate 38, or within 30 degrees of minimum, install an absorption vane on the trimmer as shown in Figure 2 of Plate 38. If the trimmer setting is 30 degrees or more from the minimum position, it need not be modified. Replace the shields.

(c) Select a convenient channel frequency on the receiver in the range 250 -260 megacycles. Tune a signal generator to the receiver, allow time for receiver and generator to stabilize and recheck the generator frequency.

(d) Turn the mixer inductance to the <u>maximum</u> inductance position (extreme counter-clockwise rotation as viewed from below the chassis). Watching an output meter closely, slowly turn the trimmer back towards the minimum setting (clockwise) until it has passed through the resonant peak and has just started down on the high frequency side of resonance. This completes the adjustment.

67. The above trimming method permits the increase in capacity of the tuning condenser, due to temperature rise, to carry the detuning effect across the top of the resonance curve, rather than down a steep slope. Some sort of a correction-vane kit might be supplied to modify existing equipments in the fleet. It would be desirable if all future RDZ and RDZ-1 equipments be modified in production so that such changes in service might not be required.

<u>CRYSTAL TESTS</u>

68. Measurements of crystal activity and frequency accuracy in the RDZ-1, Serial 1, receiver were made by the Measurements Section. Appendix 2 is a copy of their memorandum, which indicates performance of the RDZ-1 in this respect to be satisfactory.

EVALUATION OF MECHANICAL DESIGN

69. Both RDZ-1 receivers were subjected to a mechanical inspection, and the defects noted were outlined in a conference described in reference (c). A summary of these defects is given in Appendix 1.

70. The following additional equipment defects have been observed during subsequent tests:

(a) Both crystal ovens supplied became defective during tests. The thermostats failed, and no more heat was applied to the ovens. Generally, the crystal heater would be operative initially. Once the heat was cut off, however, it would not come on again. Also the fine connecting wires in these ovens are too small and inevitably break in service. Heavier wire is needed.

(b) One RDZ crystal shifted in frequency during cold runs, due to the defective crystal oven. The channel shift was approximately one megacycle. Although the crystal was defective, it would not have been apparent had the crystal oven heaters been operating properly.

(c) Defects due to shock and vibration are described in paragraphs 39 through 43. Not mentioned in this description is a brief instantaneous failure which was observed during the shock test. Each time the receiver was shocked, the plate voltage would momentarily be removed. Investigation indicated that a lead on tube socket X-103 in the multiplier section would short to another tube-socket pin. The insulation on this lead was inadequate.

(d) In some cases the vinyl insulation on connecting leads is not stripped back far enough from the soldered joints, and the insulation is scorched in making soldered connections.

(e) The spring tension on the inductance trimmers in the fourth multiplier coil and the secondary of the last i-f transformer was inadequate, allowing the screws to loosen under vibration.

(f) One variable-bandwith i-f transformer failed as described in paragraph 49. Close attention should be given to the assembly and inspection of these transformers, to ensure against similar failures in service.

(g) Not all 6F4 final multiplier tubes could be placed in the socket provided in both RDZ-1 receivers due to the wide variations in length of the sealing tip on the 6F4. It appears that the manufacturer could move this socket approximately 1/32 of an inch away from the tank condenser to provide more clearance for the tube.

(h) The r-f inductance trimmers are not readily reached when the preselector bottom cover plate is on the receiver. It requires a considerable amount of groping to successfully reach these adjustments.

(i) It is felt that the RF alignment instructions in the preliminary RDZ instruction book (reference (i)) are unnecessarily involved. A more simplified procedure should be feasible.

CONCLUSIONS

71. The manufacturer of the RDZ-1 receiver has successfully produced a unit which is closely comparable electrically and mechanically to the RDZ. If the recommendations made in this report are followed, performance in Naval service should be excellent within the basic limitations of the equipment.

72. The intent of most of the electrical performance requirements of reference (e), the governing specifications, has been met. The precise requirements of the specifications regarding electrical performance have not been met in the following characteristics: audio channel sensitivity (230 -234 mcs), r-f gain linearity, hum level, one spurious response per channel, and video fidelity. In each case, however, the RDZ-1 fails to meet the requirements by only a decibel or fraction thereof. Performance in each case is very comparable to that obtained with the CXHY, upon the performance of which the specifications were based.

73. The temperature stability requirements of reference (e) have not been fulfilled. It is believed that this defect will also be found in model RDZ equipments, since the excessive gain changes observed are due to changes in the mixer grid tank. A revised preselector alignment procedure, described in paragraph 66, was found capable of compensating for this change provided the inductance trimmer has adequate range. Consideration should be given to the reduction of capacity changes in the variable condenser at high temperatures. One of the reasons for difficulty in these equipments is the excessive inside temperature.

74. The silencer characteristics did not initially meet the requirements of reference (e). A modification in the wiring, which will apply equally to Models RDZ and RDZ-1, was made, and is described in paragraph 22. Performance after this modification met the requirements specified. In the RDZ-1, the RF and silencer controls were mistakenly interchanged in production. When wired correctly, the silencer circuits in both the RDZ and RDZ-1 appear capable of meeting the original requirements of reference (e).

75. The most serious limitations of both the RDZ and RDZ-1 equipments are the excessive number and magnitude of spurious responses, and the injection of crystal multiplier voltage into the i-f amplifier which renders the range 222 -230 megacycles impossible of use. In both these characteristi the RDZ-1 performs in the same manner as the RDZ.

76. Mechanical defects, including those revealed by shock and vibration tests, are discussed in references (b), (c), and (g); paragraphs 39 to 43, 49, and 70; and in Appendix 1. The alignment procedure described in the RDZ instruction book appears to be in need of modification. (see

paragraphs 44, 59 to 66, 70 (i)). Attention should also be given to further improving the crystal ovens used with RDZ and RDZ-1 equipments, particularly as regards thermostats and heaters.

RECOMMENDATIONS

77. It is recommended:

(a) That consideration be given in operational use to the limitations inherent in both RDZ and RDZ-1 equipments due to spurious responses, etc., and that the recommendations outlined in reference (f) be considered in the future procurement of receivers in the frequency range of 200 to 400 megacycles.

(b) That the compensating alignment procedure described in paragraph 66 be conveyed to all those who are experiencing excessive gain loss due to temperature rise as well as to the manufacturer of both models RDZ and RDZ-1.

(c) That the tolerances in the mixer inductances be made more strict, and that there always be sufficient trimmer range to adjust the inductance of all r-f tank circuits for proper alignment with some reserve in both directions.

(d) That, although little can apparently be accomplished in either model RDZ or RDZ-1 to reduce inside temperature, consideration be given in procurement of future similar equipments to avoid this defect.

(e) That the wiring in the silencer circuits in both model RDZ and RDZ-1 receivers be modified as described in paragraph 22.

(f) If not already modified since reference (i), that a better description of alighment procedure for i-f and RF be provided in the instruction book, emphasizing the need for final receiver tuning adjustments on signal or maximum noise rather than by relying on tuning meter response to multiplier voltages only. The revised alignment procedure of paragraph 66 could be made addenda to the instructions.

(g) That continuing attention be given to the improvement of the crystal ovens.

(h) That defects outlined in references (b), (c), and (g); paragraphs 39 to 43, 49, 70; and Appendix 1 be corrected to the greatest possible extent.

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REFERENCES

(a) BuShips ltr. Ser. 2372 (925Ca) of 20 March 1946, to NRL.

(b) NRL ltr. R-S67/46(1225) of 10 May 1946, to BuShips, forwarding conference report.

(c) NRL conference report R-1220-64/46 dated 25 April 1946,

(d) NRL ltr. C-S67/46(353) C-350-354/45 of 29 December 1945, to BuShips.

(e) BuShips Specification 16R64 (RE) dated 1 August 1945.

(f) NRL confidential rpt. R-2667 dated 23 October 1945.

(g) NRL Shock and Vibration Section Report No. M296,1550-125/46 (prh) dated 27 May 1946, with enclosures.

(h) BuShips specification RE9284B, dated 1 August 1944.

(i) RDZ Preliminary Instruction Book (NavShips 900,617) dated 14 April 1945.

APPENDIX 1

INSPECTION MODEL RDZ-1 RECEIVER,
SERIAL NO. 20

1. Cracked finish and filler at several joints in cabinet. Ok on #1.

2. Spot welds are appreciably deeper than those on the RDZ. OK on #1.

3. The exterior cabinet finish, though of the same color as the RDZ, has a duller surface. This is believed to be advantageous. No. 1 similar to National's RDZ.

4. *Panel Release Lever castings need smoothing. Chassis Tilt Locks appear to be nickled and tumble-polished. They would more nearly match the Release Levers if only dull nickled.

5. *Chassis supporting wedge screws at back of cabinet appear short - should be lengthened by about 2 threads. The lock nuts had not been tightened on No. 1.

6. *The recent change to Dzus fasteners on the preselector cover has been found to seriously affect the shielding integrity of the RDZ. In the RDZ-1, the adjacent faces of the two castings are neither flat nor free of paint, and a piece of paper can be inserted at various points with all Dzus fasteners locked. It is recommended that either a tongue joint be employed at this point or that some continuous grounding-spring means be devised for both receivers.

7. The plating is scraped from the nut of the Power switch. OK on #1.

8. *The flat head machine screws which support the chassis slide rails at each side are all cocked upward, and the cabinet holes therefore are countersunk too deep. It is believed that the misalignment of the screws is due to the use of over-sized nuts which bear edgewise against the upper horizontal sufaces of the guide rails.

9. The button lock on the left hand Panel Release Lever is difficult to operate. OK on #1.

10. The Channel Dial numerals are not centered in the window. OK on #1.

11. *The filter blister locking mechanism, left side as viewed from the front of the cabinet, does not hold the filter panel in contact with the rear wall of the cabinet (about 3/32" play).

12. *The labeling on the rear filter-lead sleeves is difficult to read. This is due to blurring and insufficient contrast between the background and marking color employed.

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13. *It could not be determined whether the filter mounts and other terminal boards have been wax impregnated, due to the presence of an outer lacquer or fungicidal treatment.

14. *The lacing twine used for cabling leads in the filter compartment and in the preselector unit is oversized and apparently non-moisture proof. The twine employed for this purpose in the IF/AF unit is smaller and appears to have been impregnated.

15. *The cable clamp which secures the cabinet cable to the rear right-hand side of the filter panel should be twisted to conform with the angle at which the cable enters. As now arranged, one edge of the clamp bites severely into the cable insulation.

16. *The holding arms of the clamps which secure the two cables to the top of the cabinet, at the rear, are too long. Thus it is impossible to remove the cables therefrom without loosening the securing screws at the top of the cabinet; and these, in turn, cannot be reached if the receiver is mounted in a rack. The cables have to be removed from these clamps before the rear filter unit can be drawn into the cabinet.

17. The leads from the right-hand cabinet cable should be drawin in closer on the underside of the Autotune terminal strip in order to facilitate removal of the thumbscrews which secure the front preselector-tank-shield cover. OK on #1.

18. The metal slug in the 4th multiplier tank inductor is adjusted at the wrong end of the coil. This results in a long supporting screw which may cause excessive temperature drift. OK on #1.

19. *The R.F. Tuning Capacitor Trimmer adjusting slots appear to have been sawed after plating. (Probably an R.C.C. operation - RDZ's same).

20. A bent terminal stud was noted in the preselector of Ser. No. 20.

21. *Capacitor C-146 is supported only by its leads, which are excessively long.

22. *The Weston meter terminal studs and nuts are unplated. Although this complies with JAN meter specifications, it does not comply with the general specifications for the subject equipment.

23. *All control knobs on the IF/AF unit are secured too close to the recessed panel, except the I-F bandwidth control knob, which projects about 1/64" above the main panel.

24. *The pigtail leads on terminal-strip-mounted capacitors and resistors project too far. These leads should be clipped about 3/32" beyond the terminal studs.

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25. *The leads of the I-F transformer resonating capacitors are bent to too sharp a radius. These transformers bear the National Company's Navy type designation letters and their commercial trade mark.

26. *The clamps employed to secure the power-filter capacitors are split at both sides due to double intersecting bends. Suggest flattening channel section 1/2" above feet and use of washers under mounting screws.

27. The paint on the power transformer and filter chokes is peeling off, particularly in the areas where the nomenclature is stenciled. OK on No. 1.

28. Many screws employed for securing components are unnecessarily long. In one case, within the right-rear corner of the power-unit chassis, two such screws collided at 90°, bending both. Not so flagrant in No. 1.

29. *Two different types of screw drivers are required for releasing and securing the vacuum tube clamps, Phillips' and plain.

20. *There is excessive use of internal-tooth lock washers. The external-tooth type should be used wherever feasible.

32. The main Model nameplate and several component identification plates are missing on Ser. No. 20.

33. *The antenna plug 1-C connector should be wired to the shell.

34. *It is extremely difficult to remove the preselector panel projection as an aid in replacing components. On both RDZ and RDZ-1 receivers access to over half of the securing screws for this projection is from the inside of the receiver, it is impossible to reach these screws without a special tool, In future similar designs these screws should all be accessible with ease from the front of the receiver. (This item is supplemental to original inspection)

*Items marked thus apply equally to Serials No. 20 and No. 1.

S67/40(1254)

1250-255/46

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APPENDIX 2

MEMORANDUM

22 May 1946

To: Code 1220 (1225)

From: Code 1250

Subj: Check of frequency and activity correlation of the Model RDZ-1 to the Model RDZ Receiver - Problem No. S1174.1T

Encl: (HW)
(A) Table of measurements

1. As per verbal request of code 1235, this Section conducted a series of tests to check the degree of correlation between representative models of the two equipments.

2. Enclosure (A) shows the results of measurements on these two receivers using a set of ten crystals covering the range of the equipments. From these tests, two conclusions may be drawn.

(a) That the frequency correlation is within the specified limits showing a maximum probable divergence of 0.001% at the extreme low end of the band (about 5 Mc.) and well within 0.0002% at the high end.

(b) That the Model RDZ-1 will oscillate readily with minimum activity crystals.

Dr. S. G. Lutz
Head, M & C

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1250-255/46
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APPENDIX 2

Comparison of the Model RDZ-1 Equipment, Ser. No. 1
Mfgd. by Admiral Corp. to the Model RDZ,
Mfgd. by National Corp. with respect to
Activity and Frequency Correlation

Oven Pos. No.	Marked Freq. Kc.	Interpolation Oscillator Reading RDZ	Interpolation Oscillator Reading RDZ-1	Activity in Test Set-ua	% Freq. diff.
1	5118.75	1,674	1,704	79.	0.0006
2	5200.00	1,904	1,923	79.	0.0004
3	5401.56	1,559	1,550	34.	0.0002
4	5551.56	1,653	1,638	69.	0.0002
5	5870.37	0,354	0,344	51.	0.0002
6	6051.56	1,545	1,535	40.	0.0002
7	6266.66	3,338	3,353	58.	0.0002
8	6325.96	4,133	4,145	74.	0.0002
9	6435.42	4,800	4,810	35.	0.0002
10	6685.18	4,862	4,851	65.	0.0002

Note 1: Minimum activity crystals up to 5.25 Mc. = 40 ua.
Minimum activity crystals above 5.25 Mc. = 35 ua.

Note 2: All of the above crystals successfully drove the Model RDZ-1 equipment.

Note 3: An artificial crystal of f = 5.5 Mc., activity = 30 ua, also successfully drove the Model RDZ-1 equipment.

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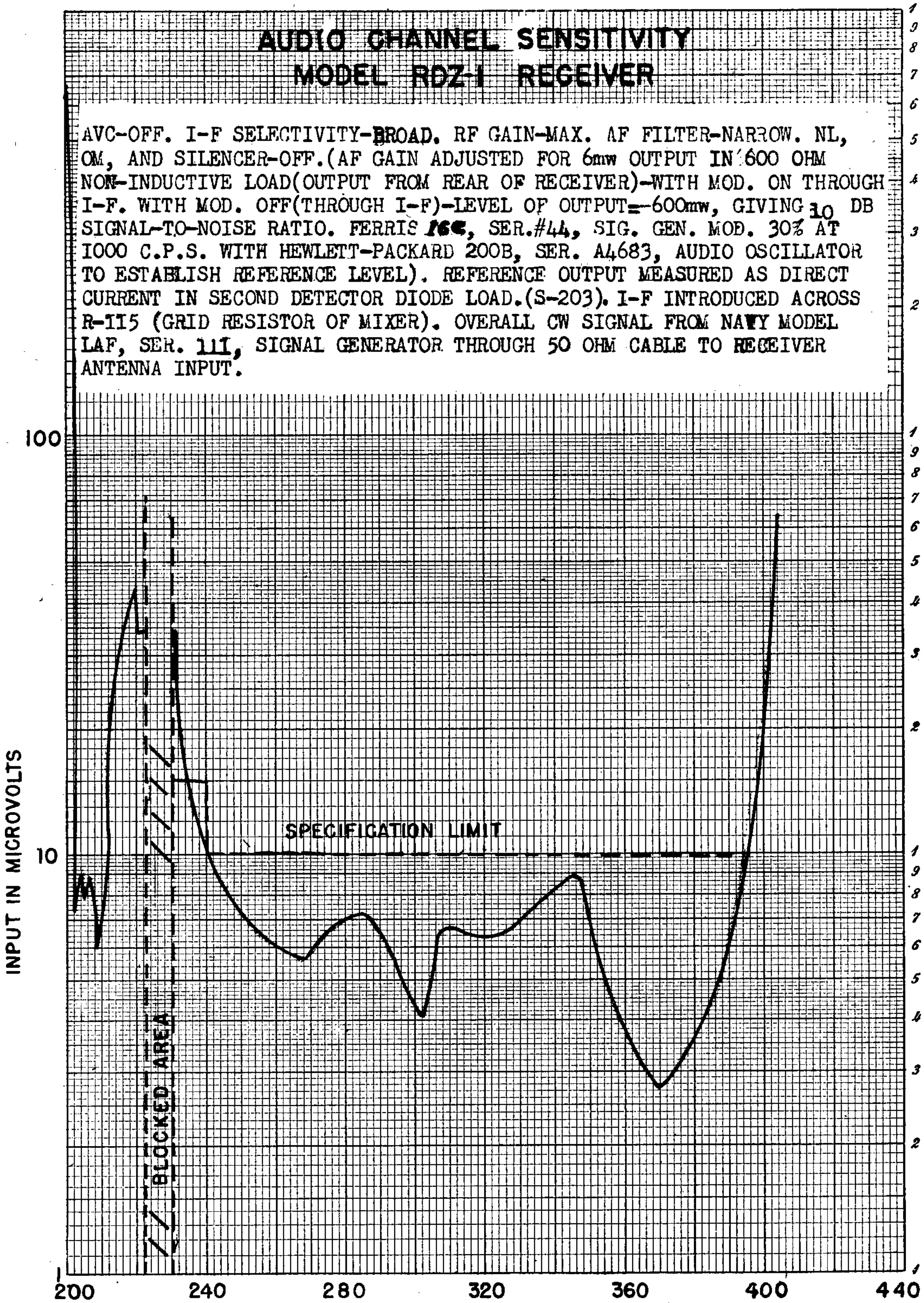

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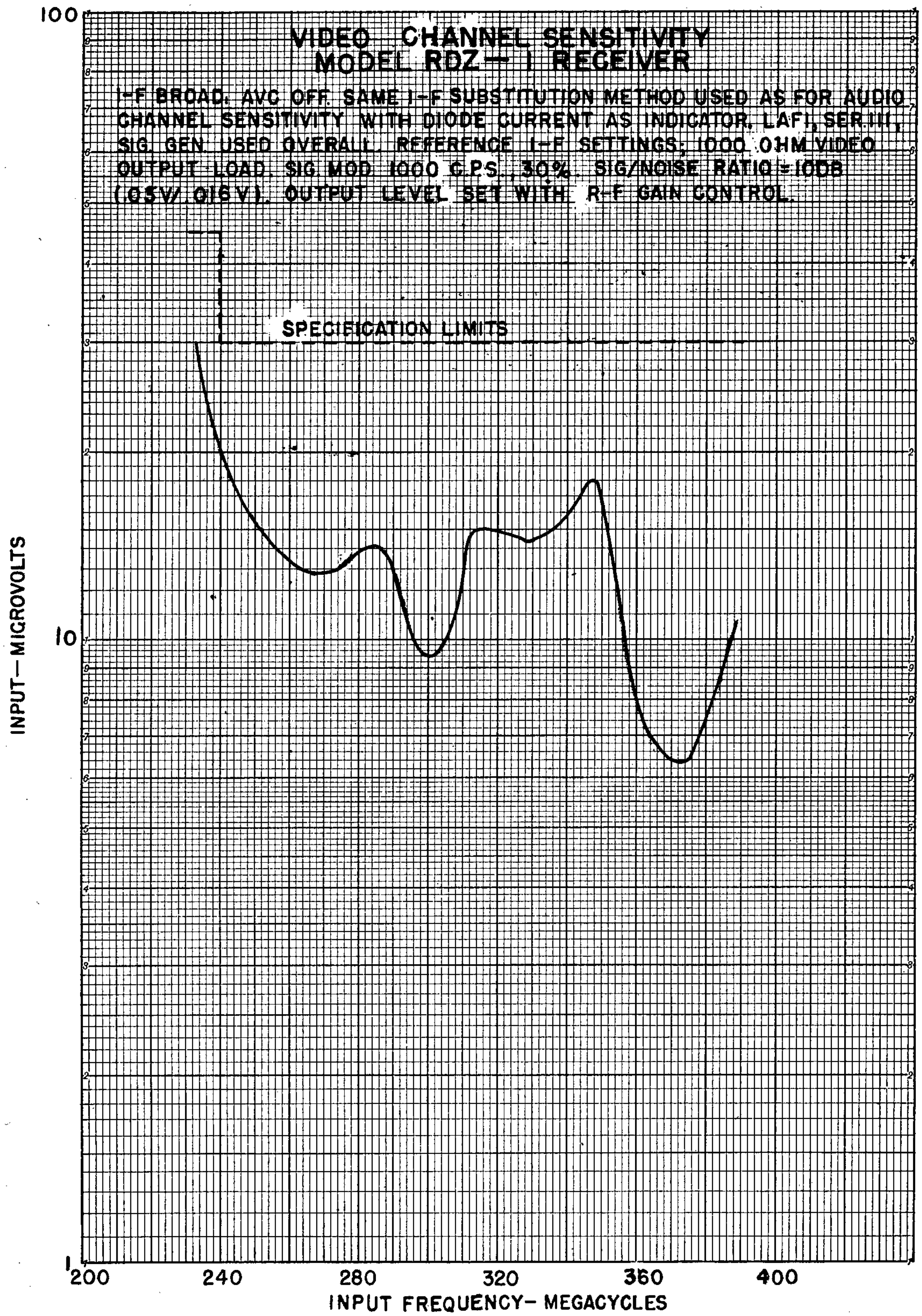

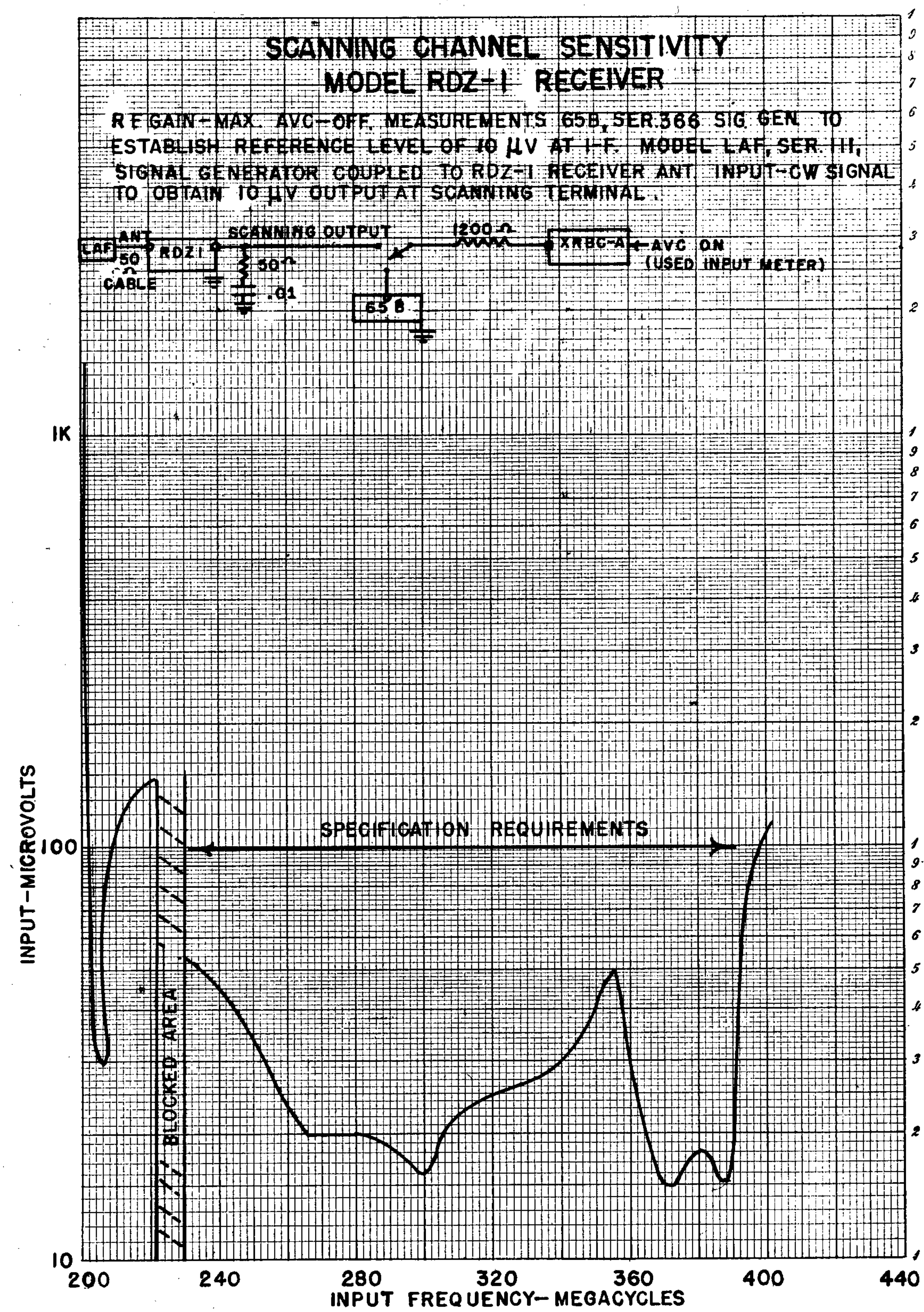

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PLATE 3

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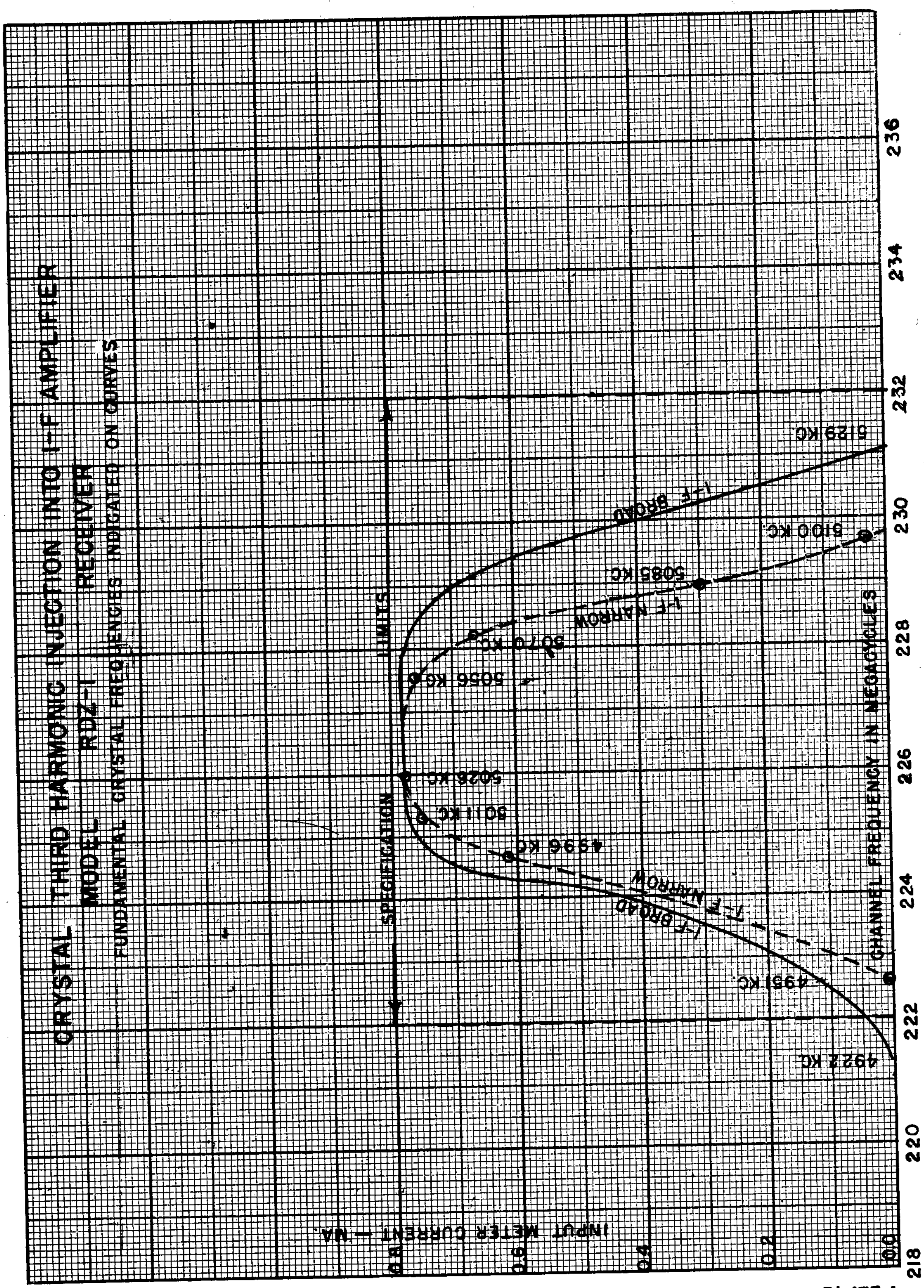

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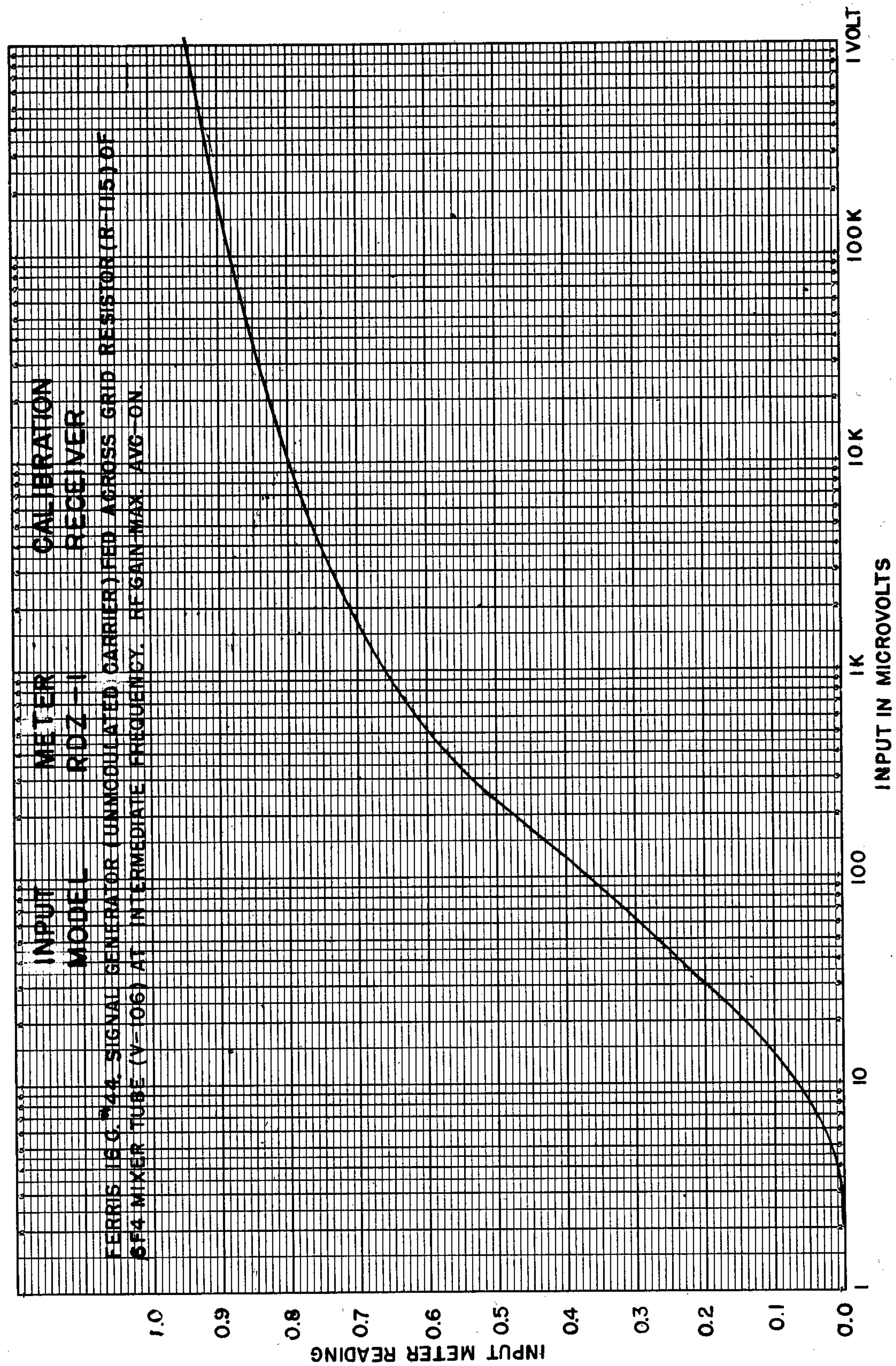

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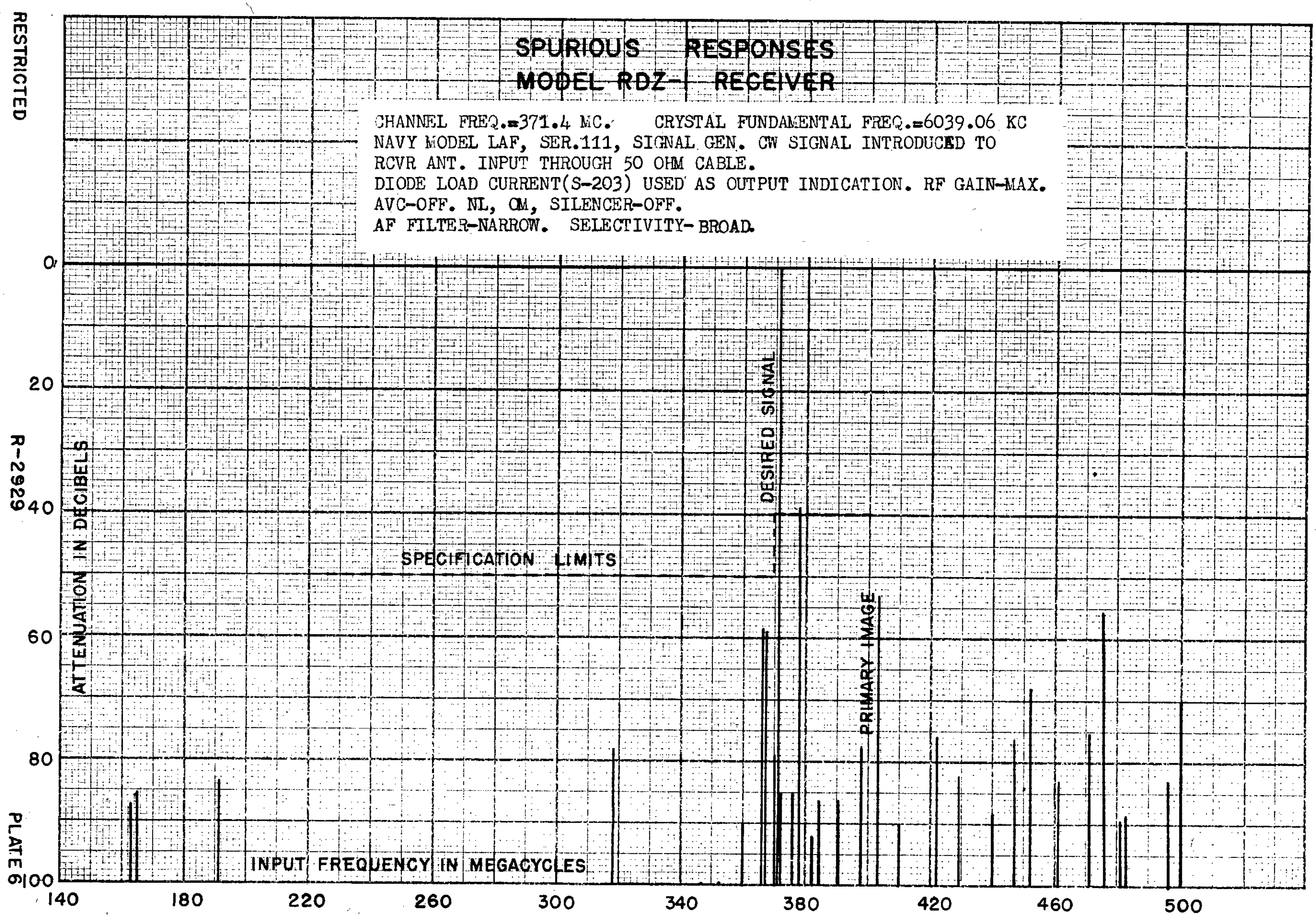

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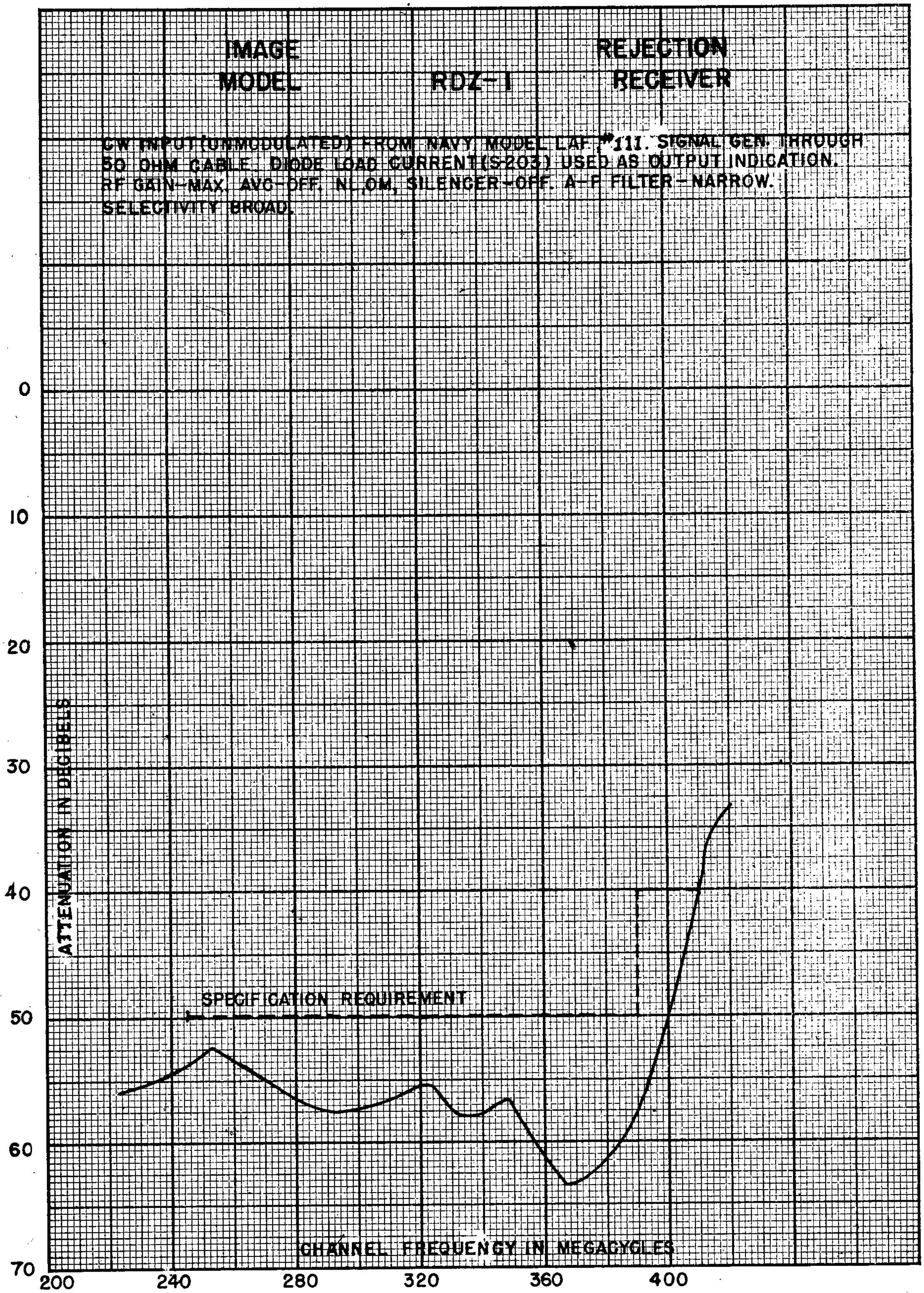

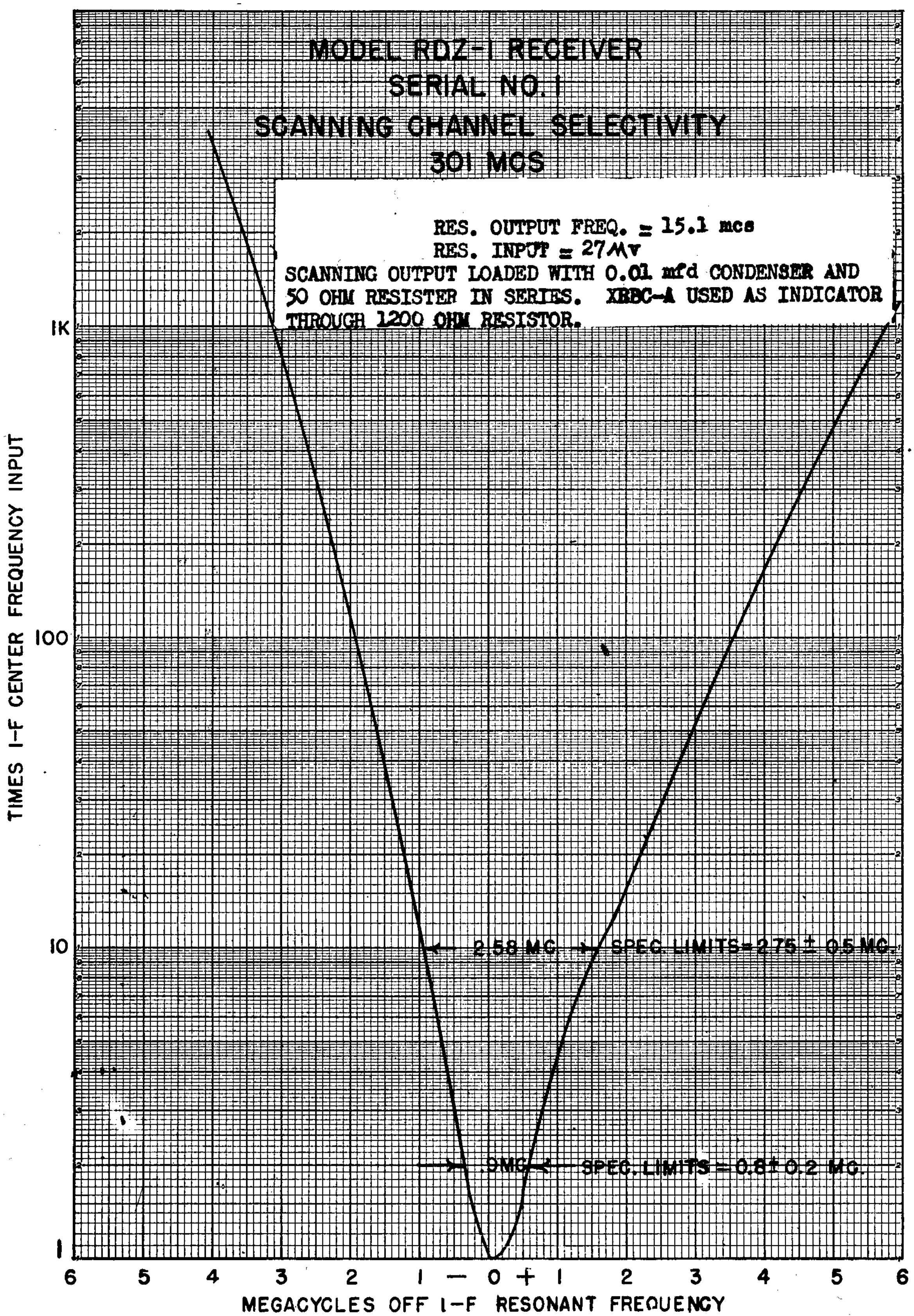

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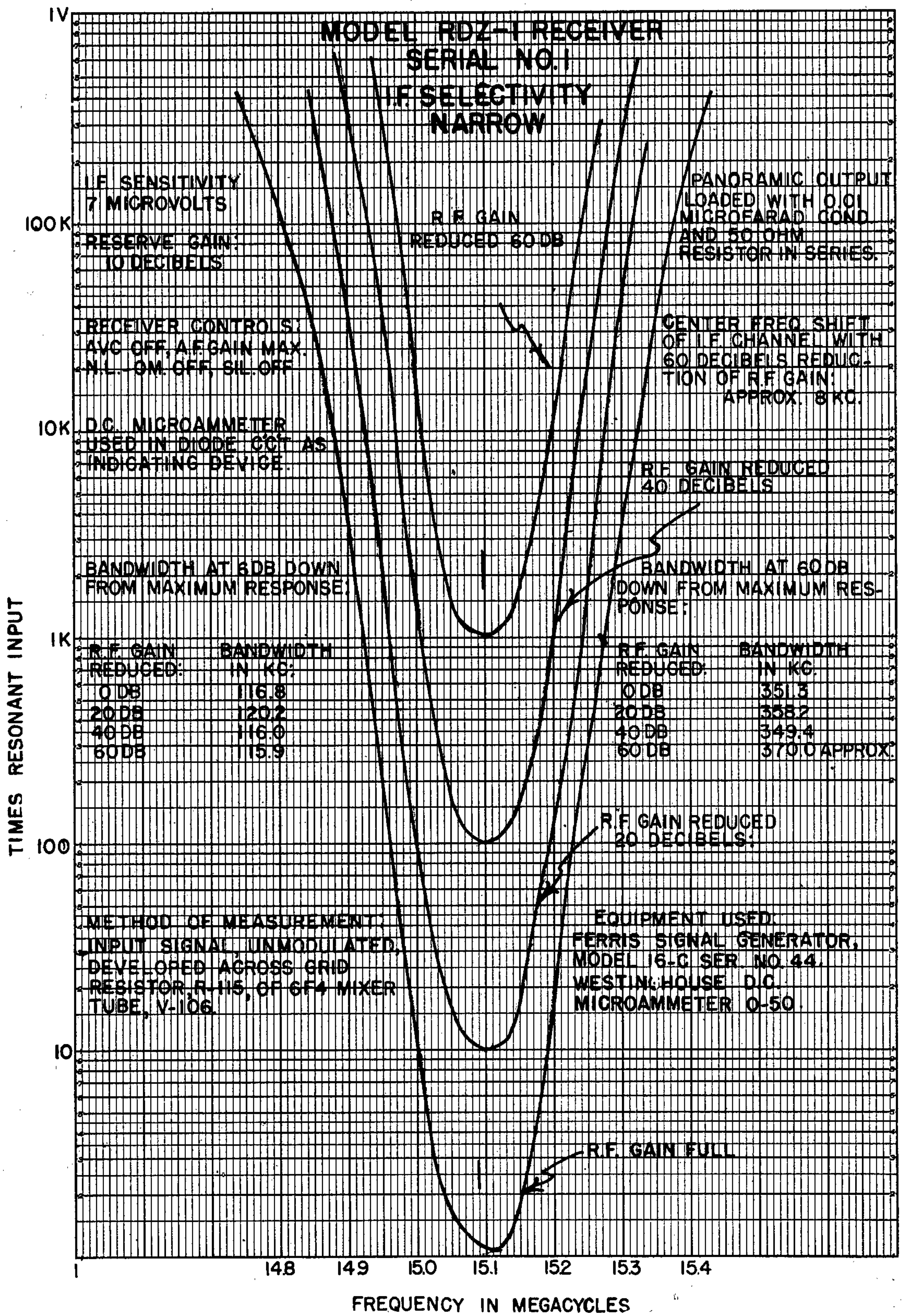

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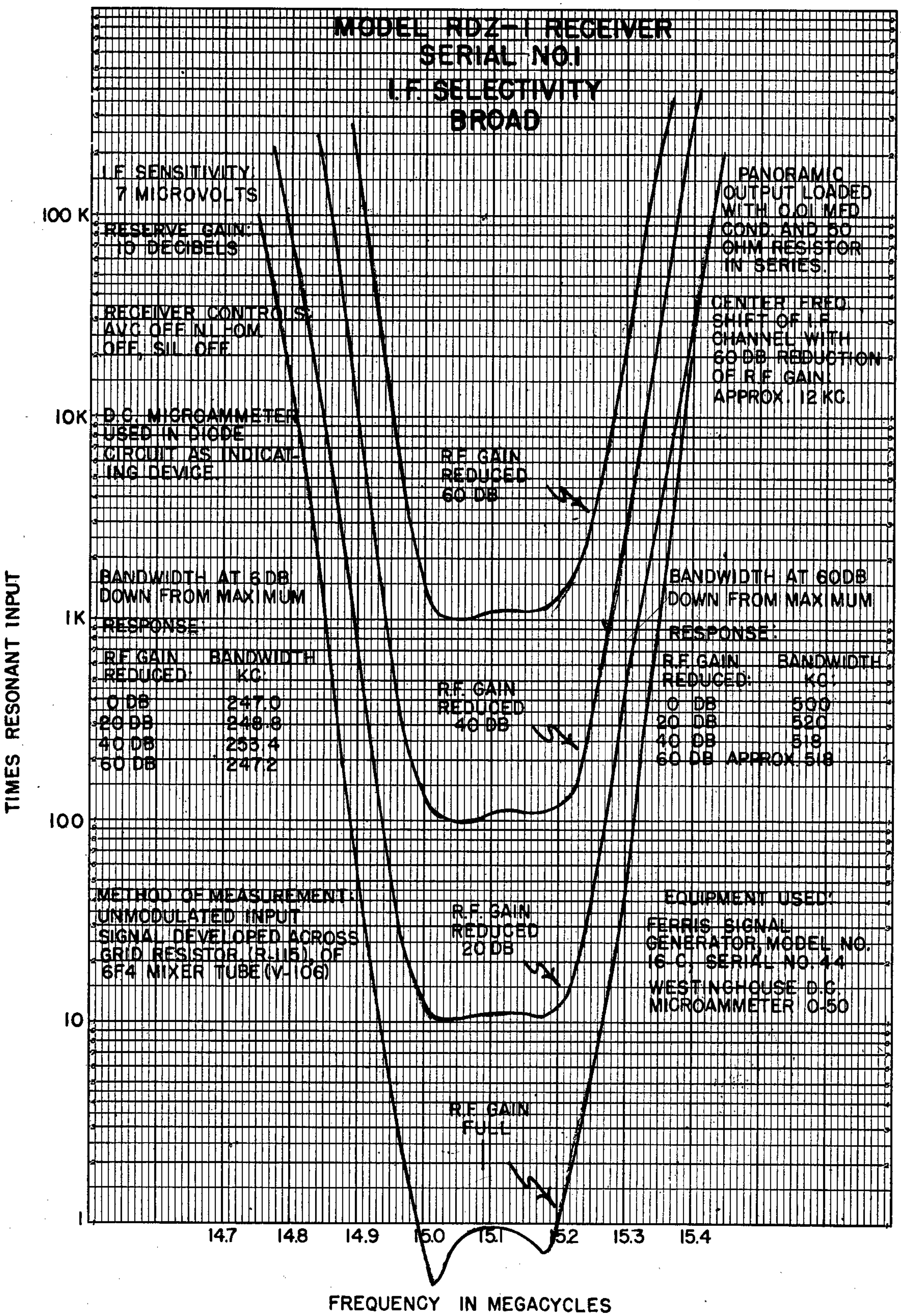

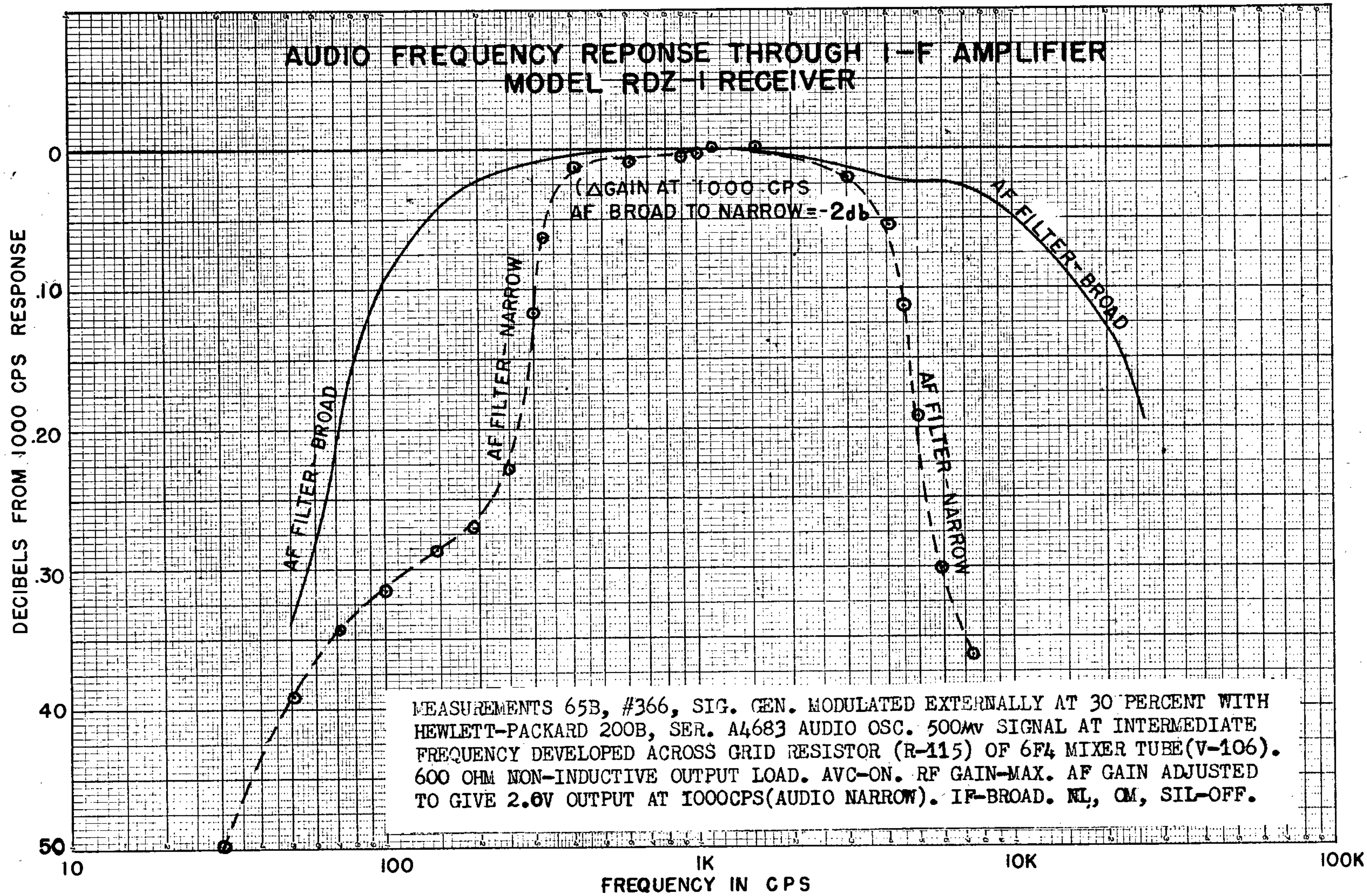
AUDIO FREQUENCY REPONSE THROUGH I-F AMPLIFIER
MODEL RDZ-I RECEIVER
0
10
20
30
40
50
DECIBELS FROM 1000 CPS RESPONSE
10
100
1K
10K
100K
FREQUENCY IN CPS
AF FILTER-BROAD
AF FILTER-NARROW
(ΔGAIN AT 1000 CPS
AF BROAD TO NARROW=-2db
AF FILTER-NARROW
AF FILTER-BROAD
MEASUREMENTS 65B, #366, SIG. GEN. MODULATED EXTERNALLY AT 30 PERCENT WITH HEWLETT-PACKARD 200B, SER. A4683 AUDIO OSC. 500mv SIGNAL AT INTERMEDIATE FREQUENCY DEVELOPED ACROSS GRID RESISTOR (R-115) OF 6F4 MIXER TUBE(V-106). 600 OHM NON-INDUCTIVE OUTPUT LOAD. AVC-ON. RF GAIN-MAX. AF GAIN ADJUSTED TO GIVE 2.6V OUTPUT AT 1000CPS(AUDIO NARROW). IF-BROAD. NL, CM, SIL-OFF.

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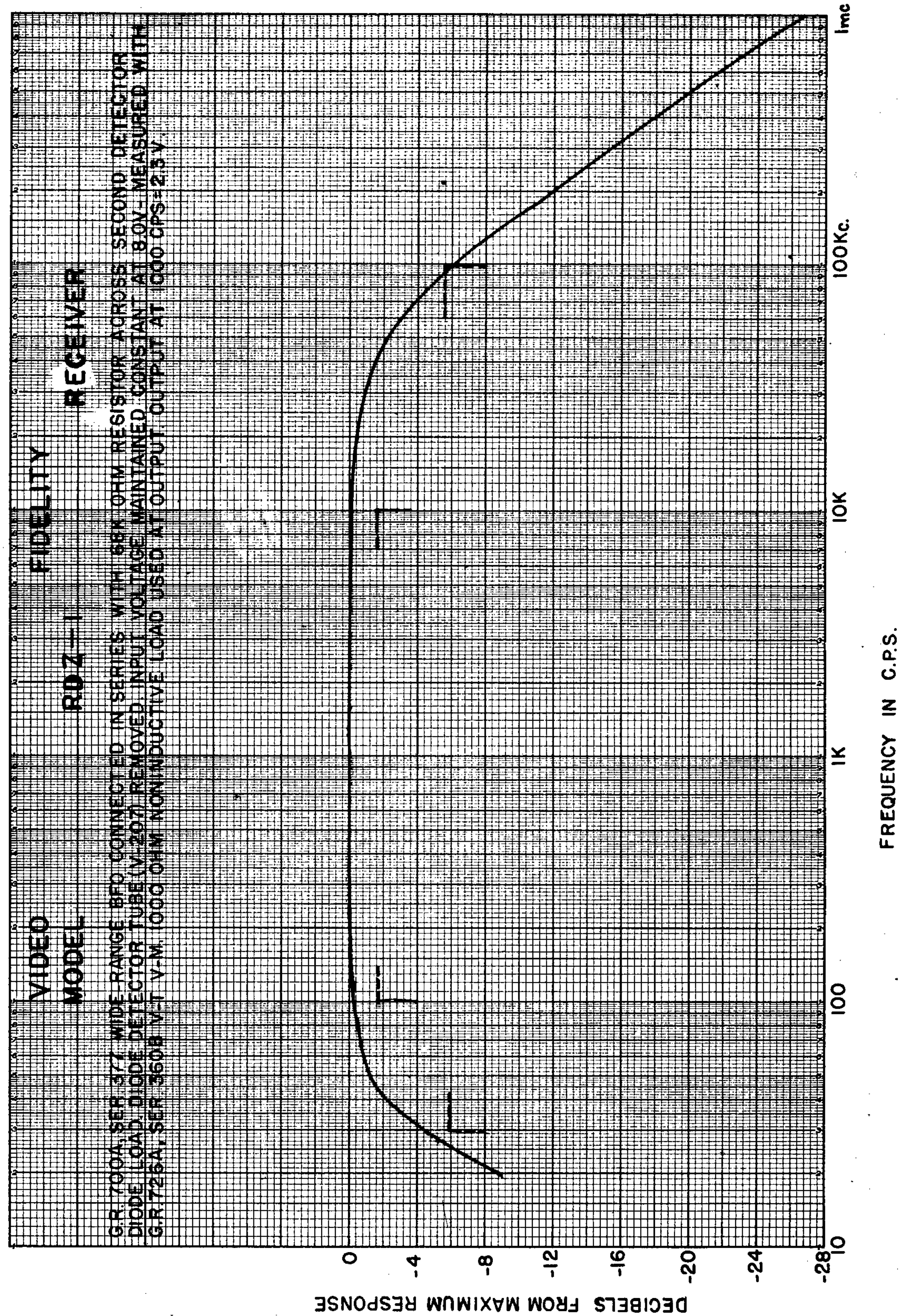

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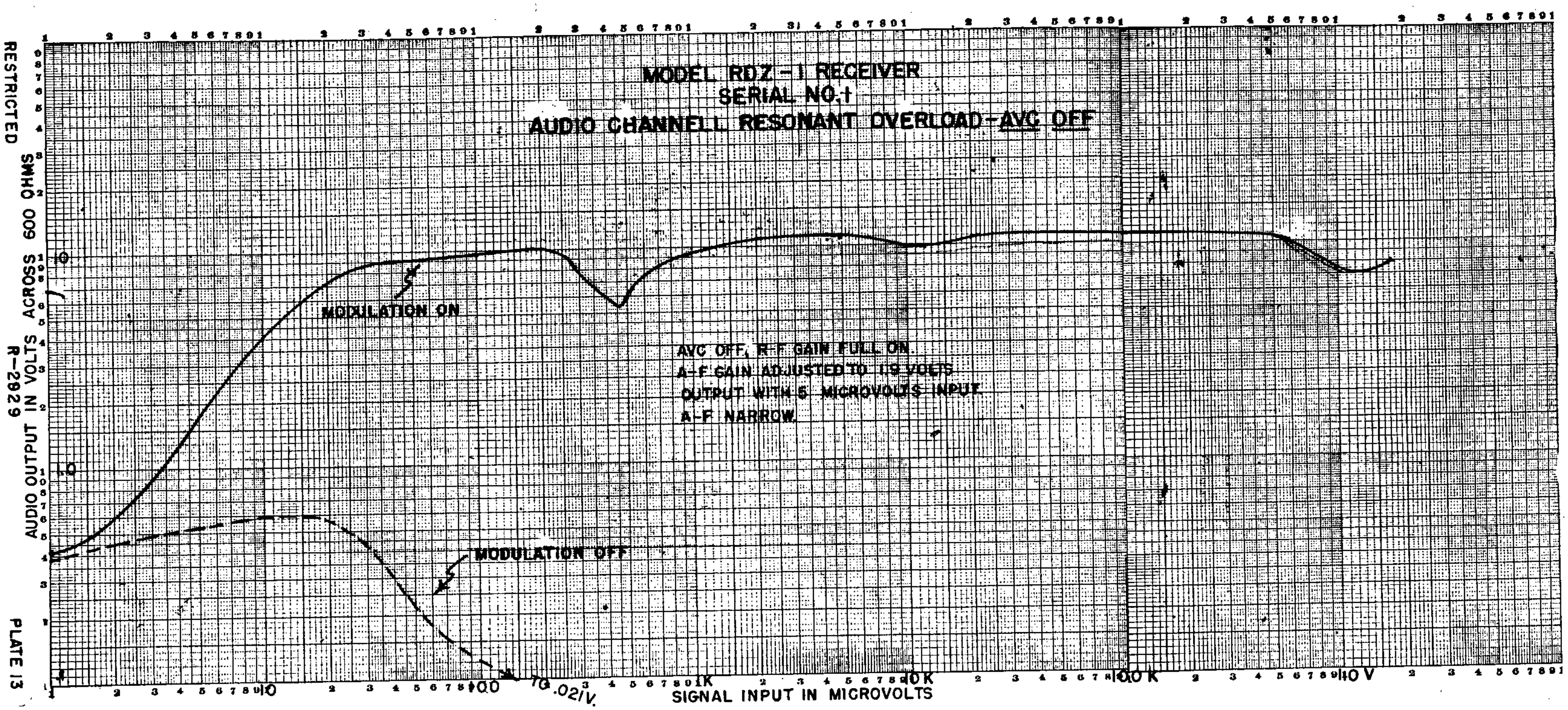

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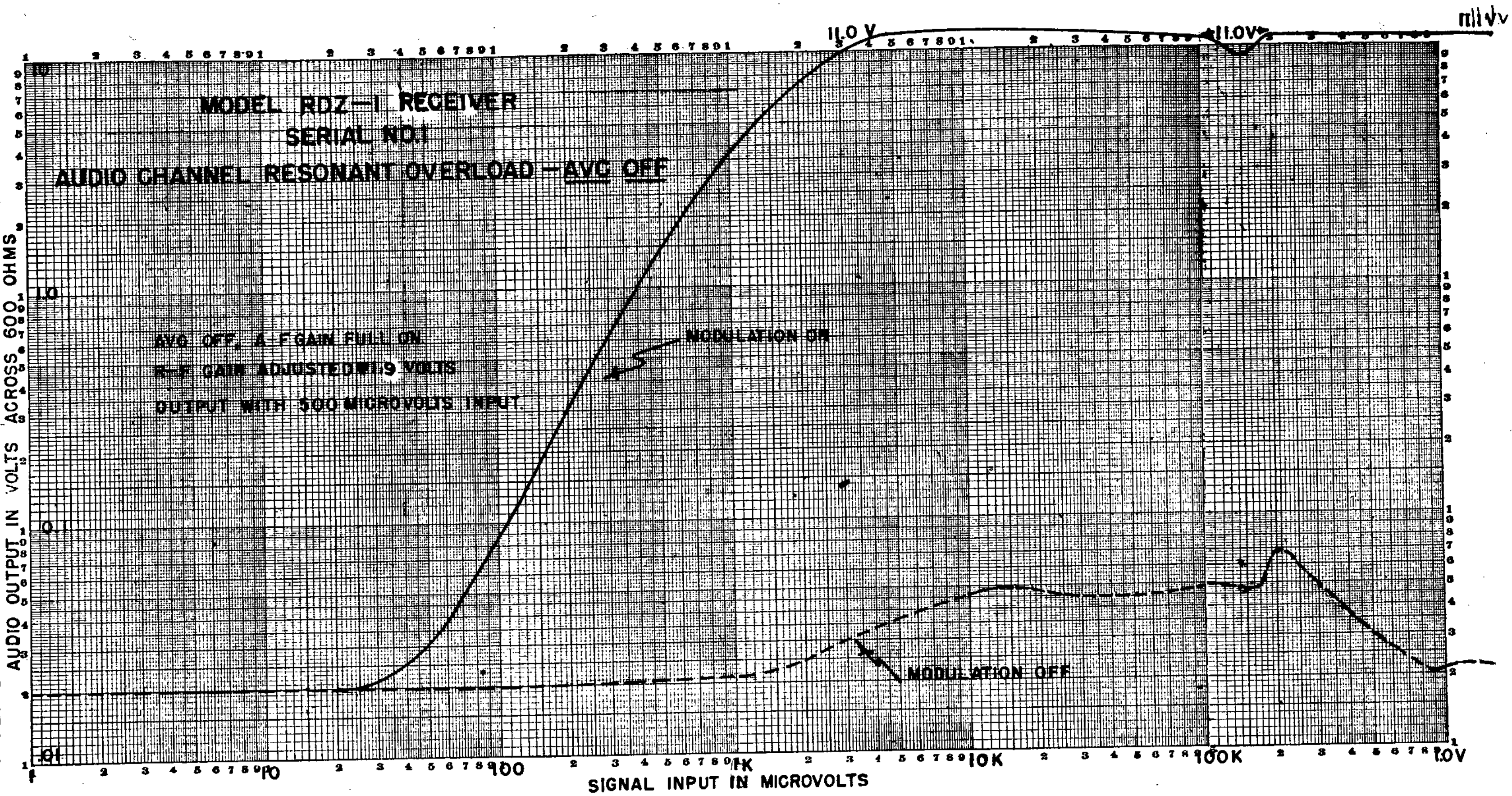
PLATE 13



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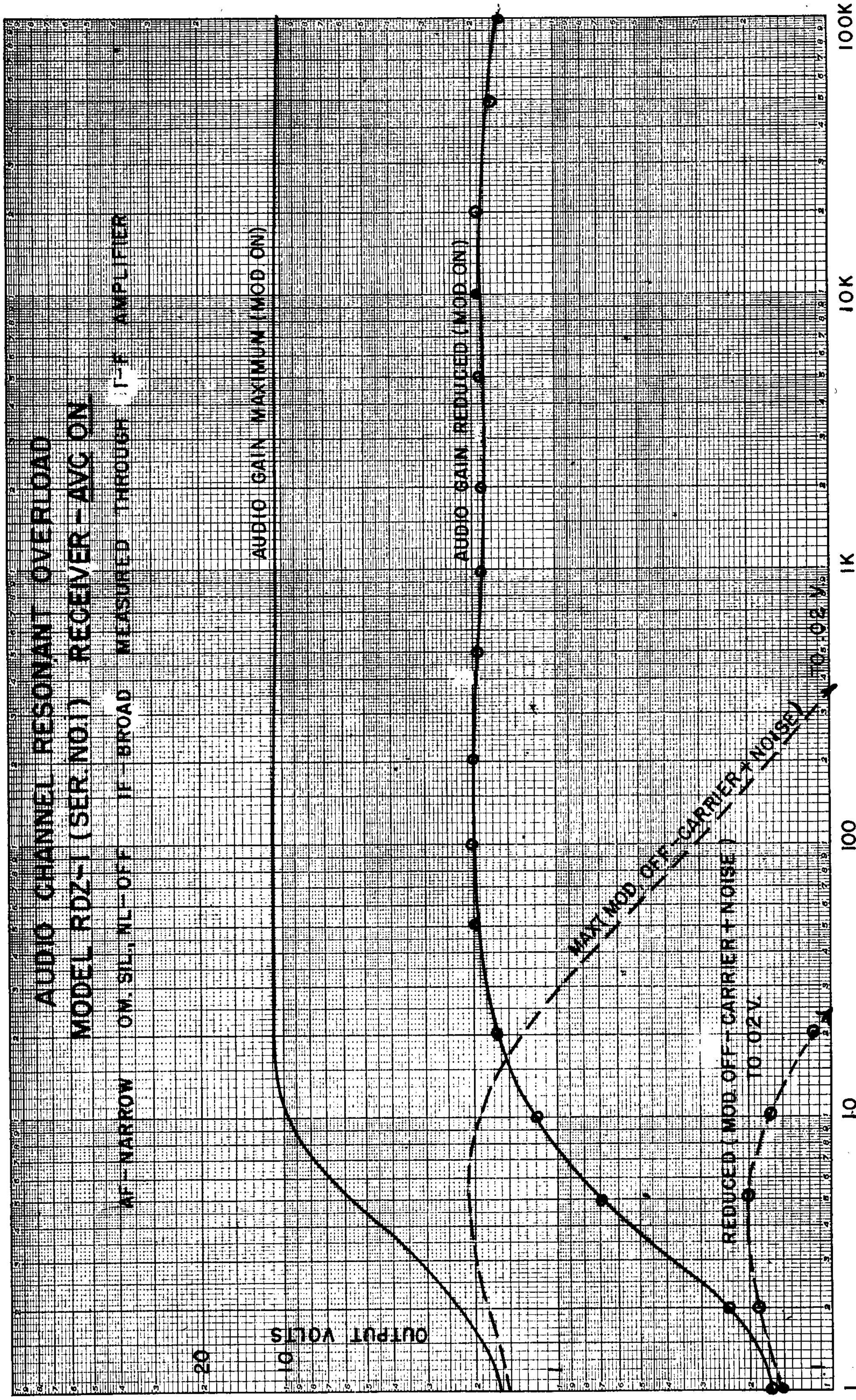

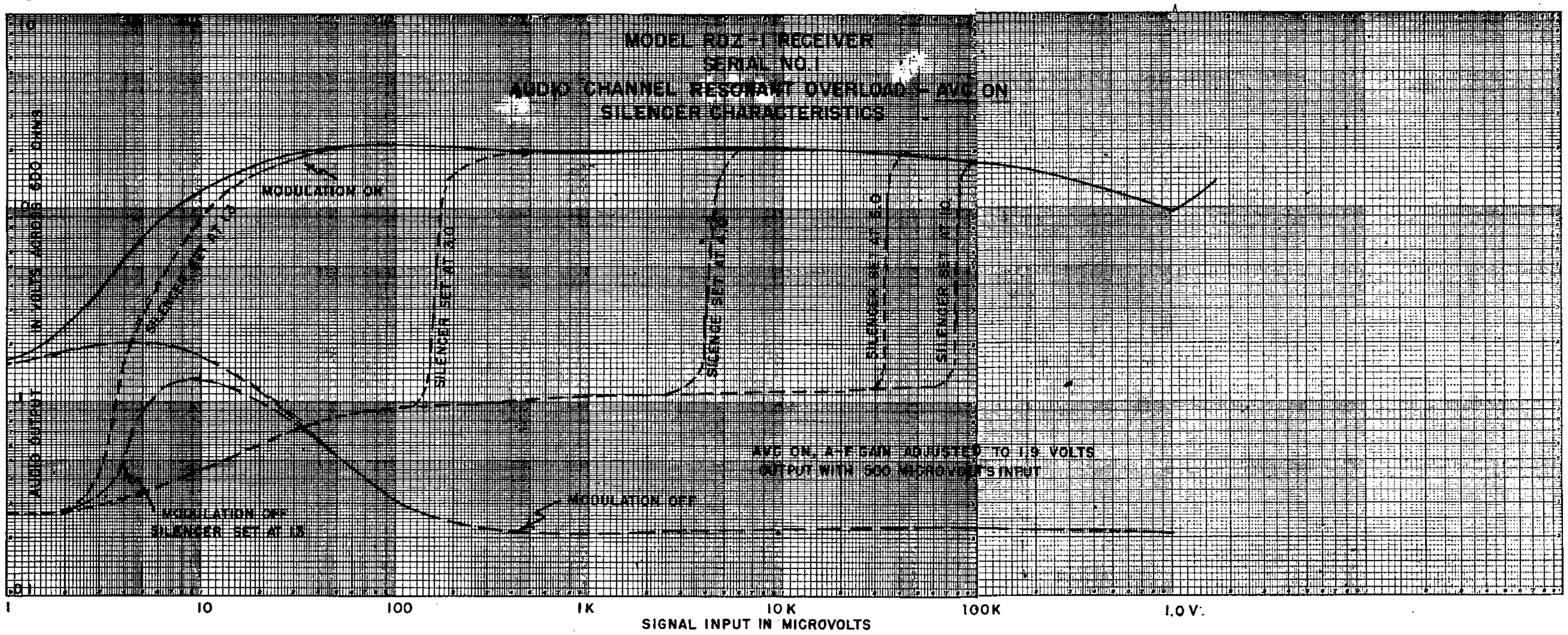

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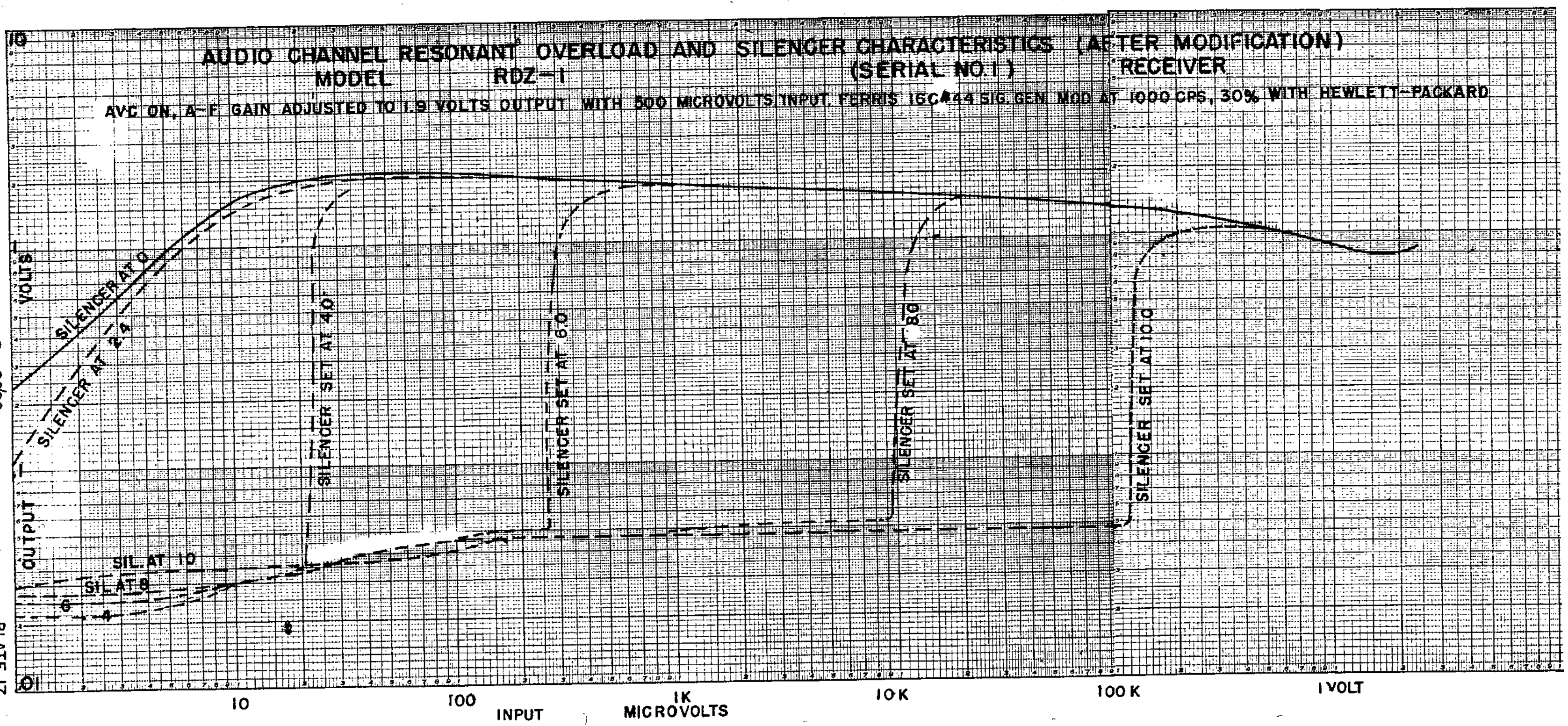

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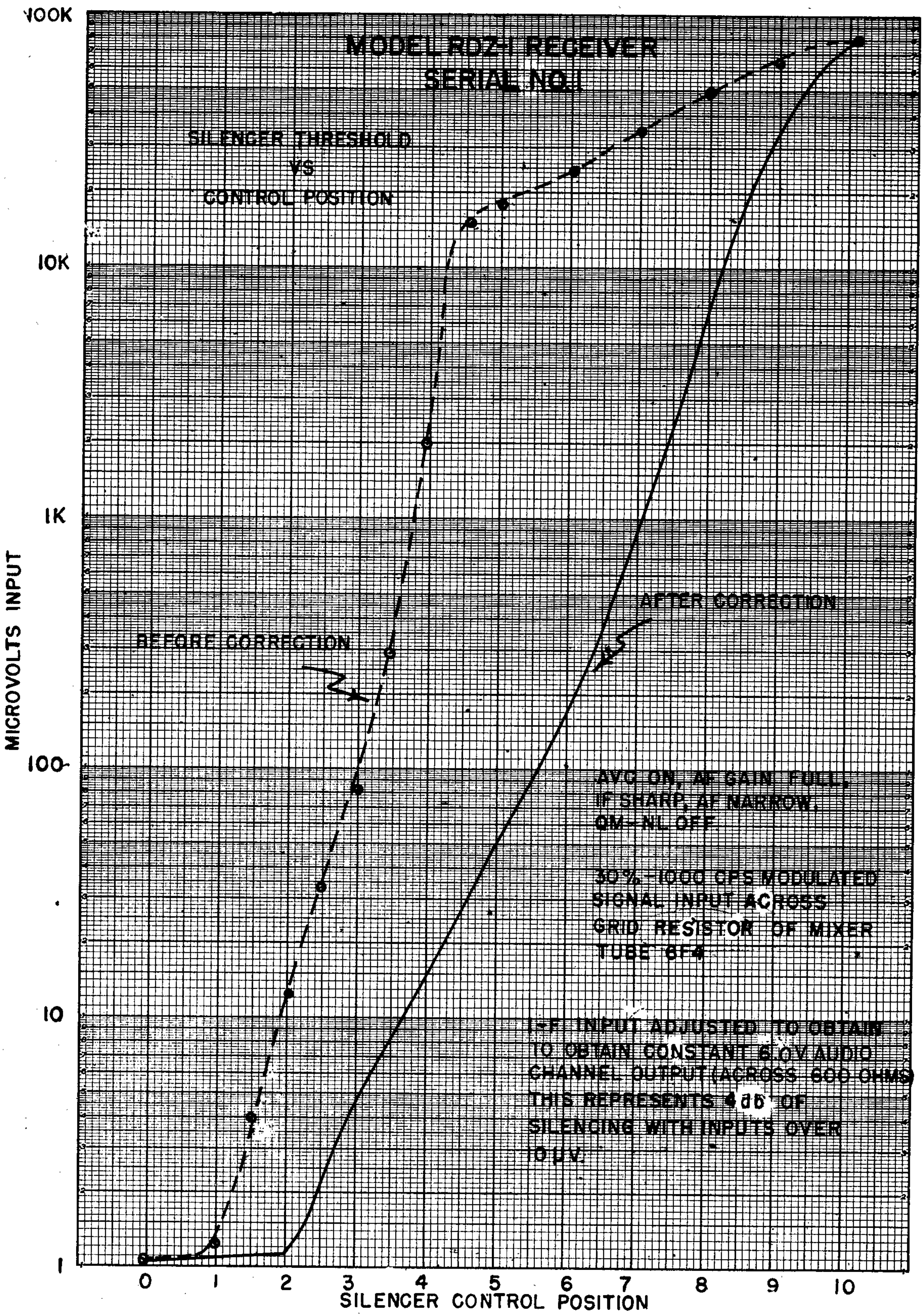

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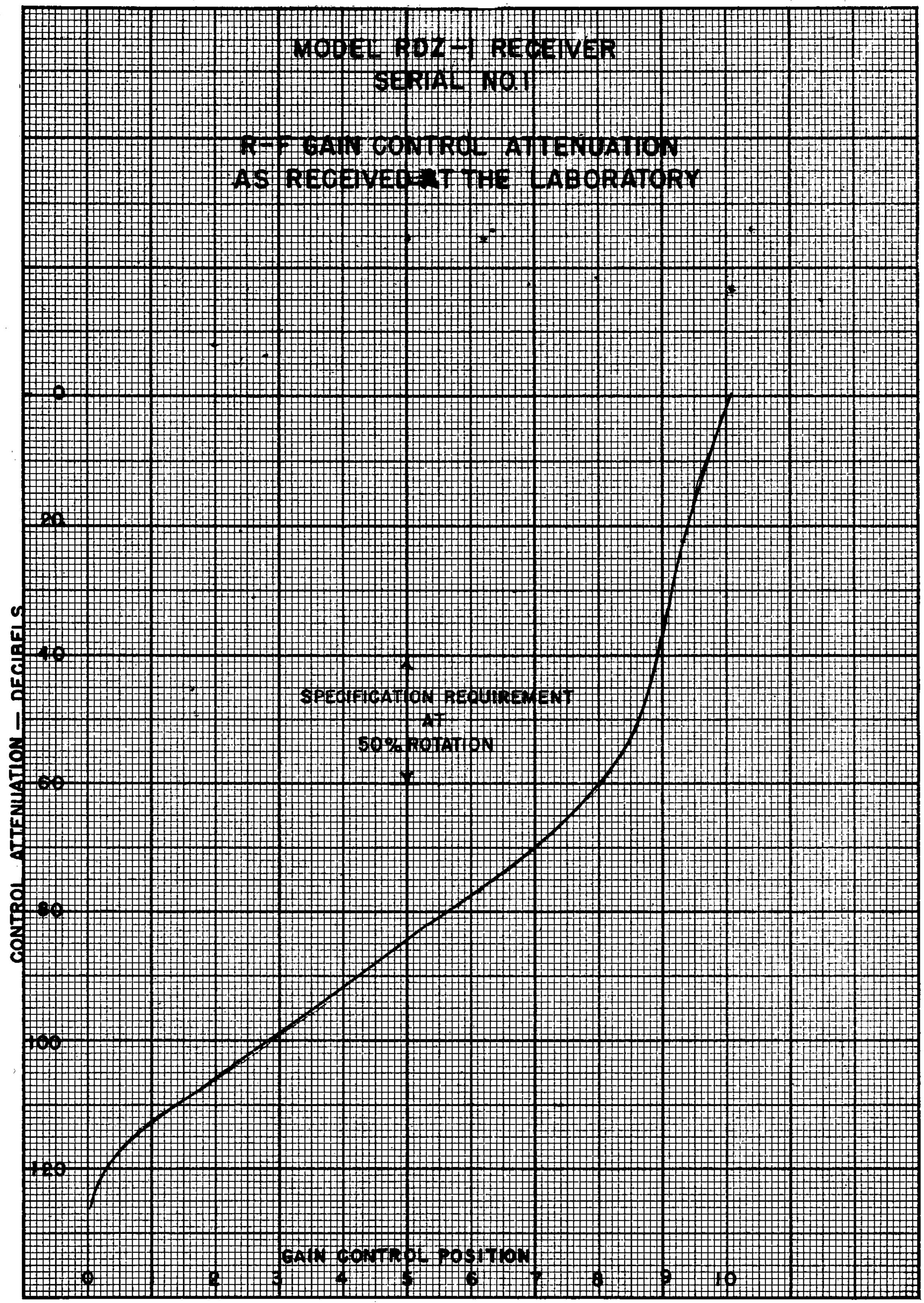

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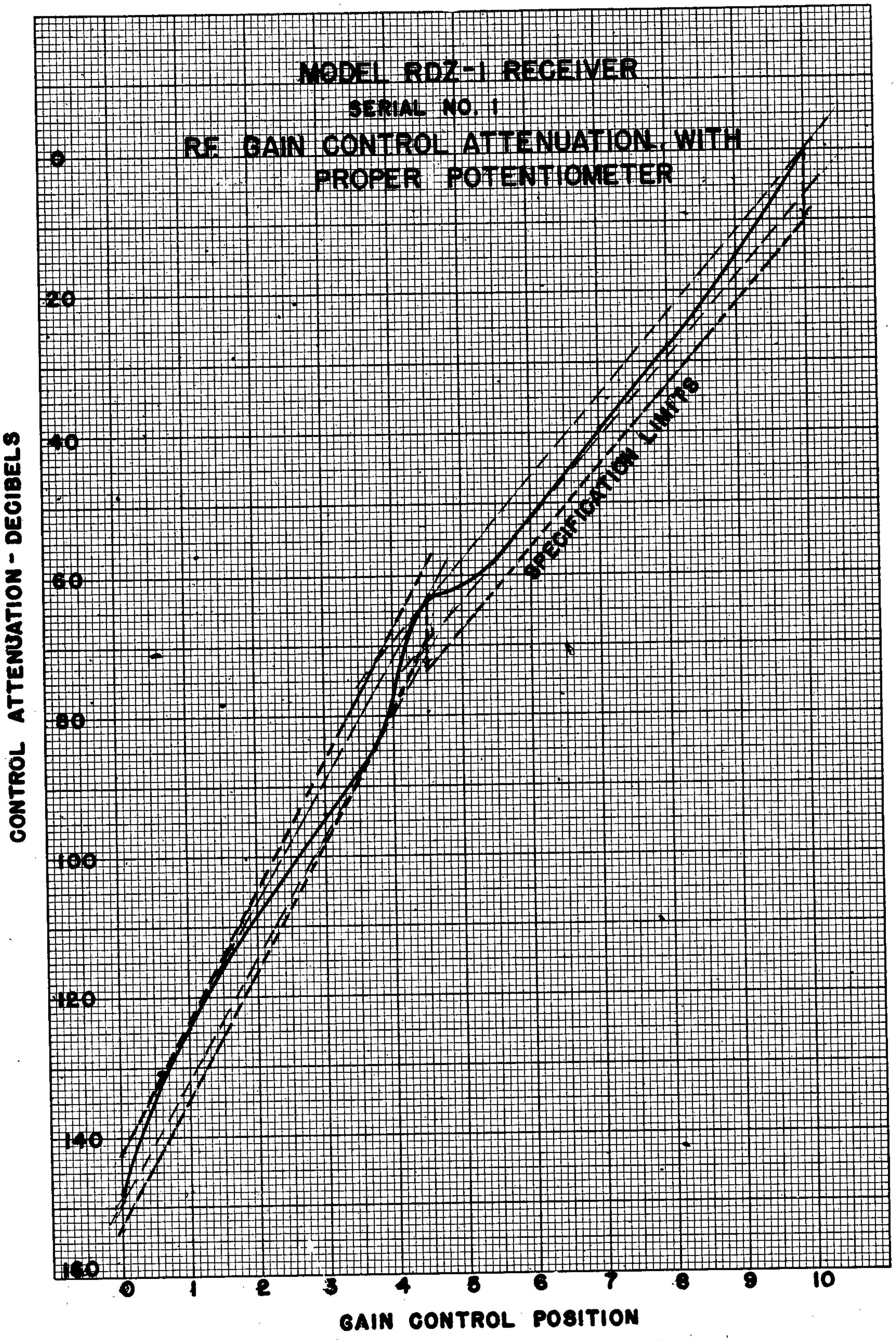

PLATE 20

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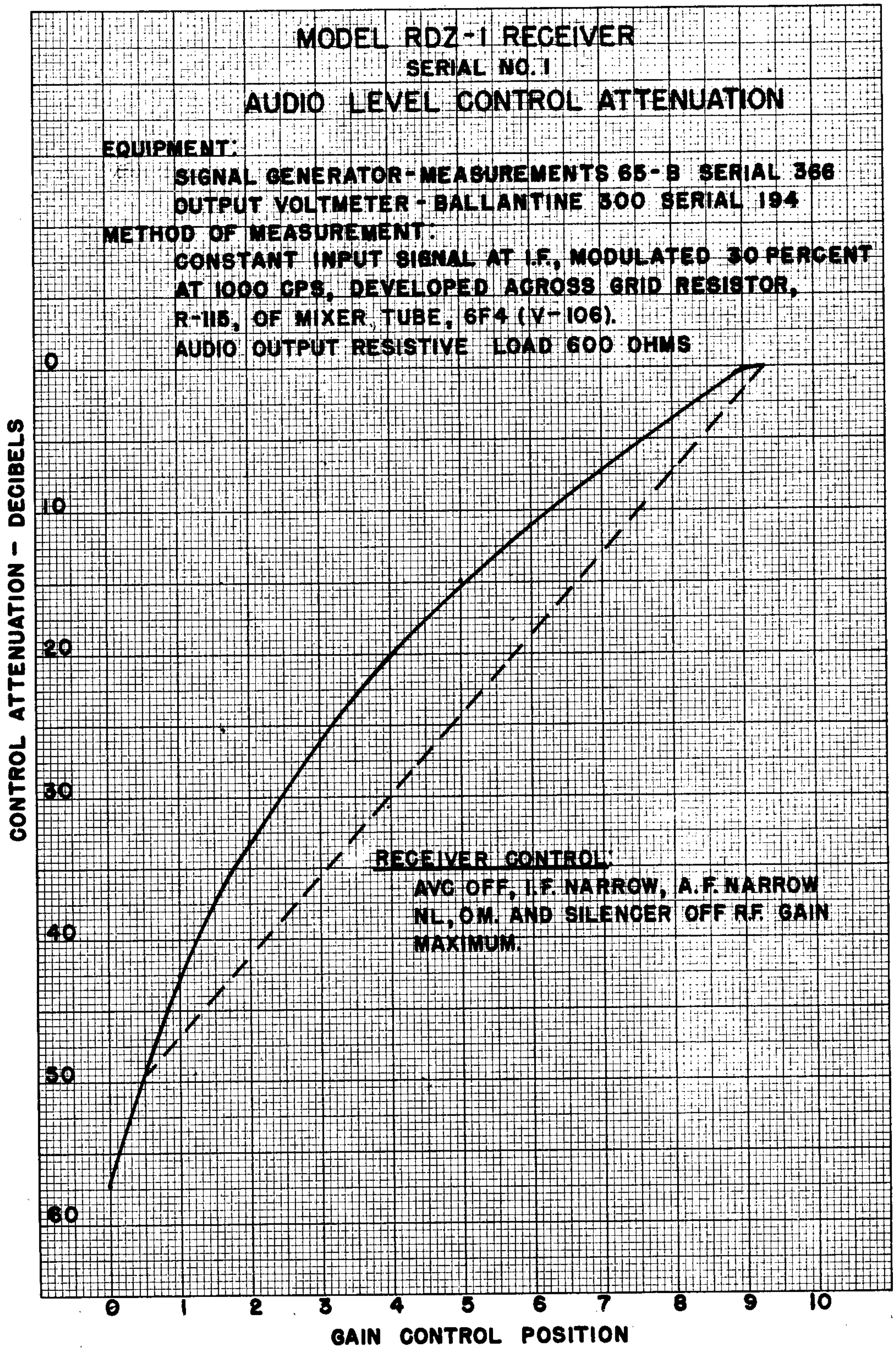

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PLATE 21

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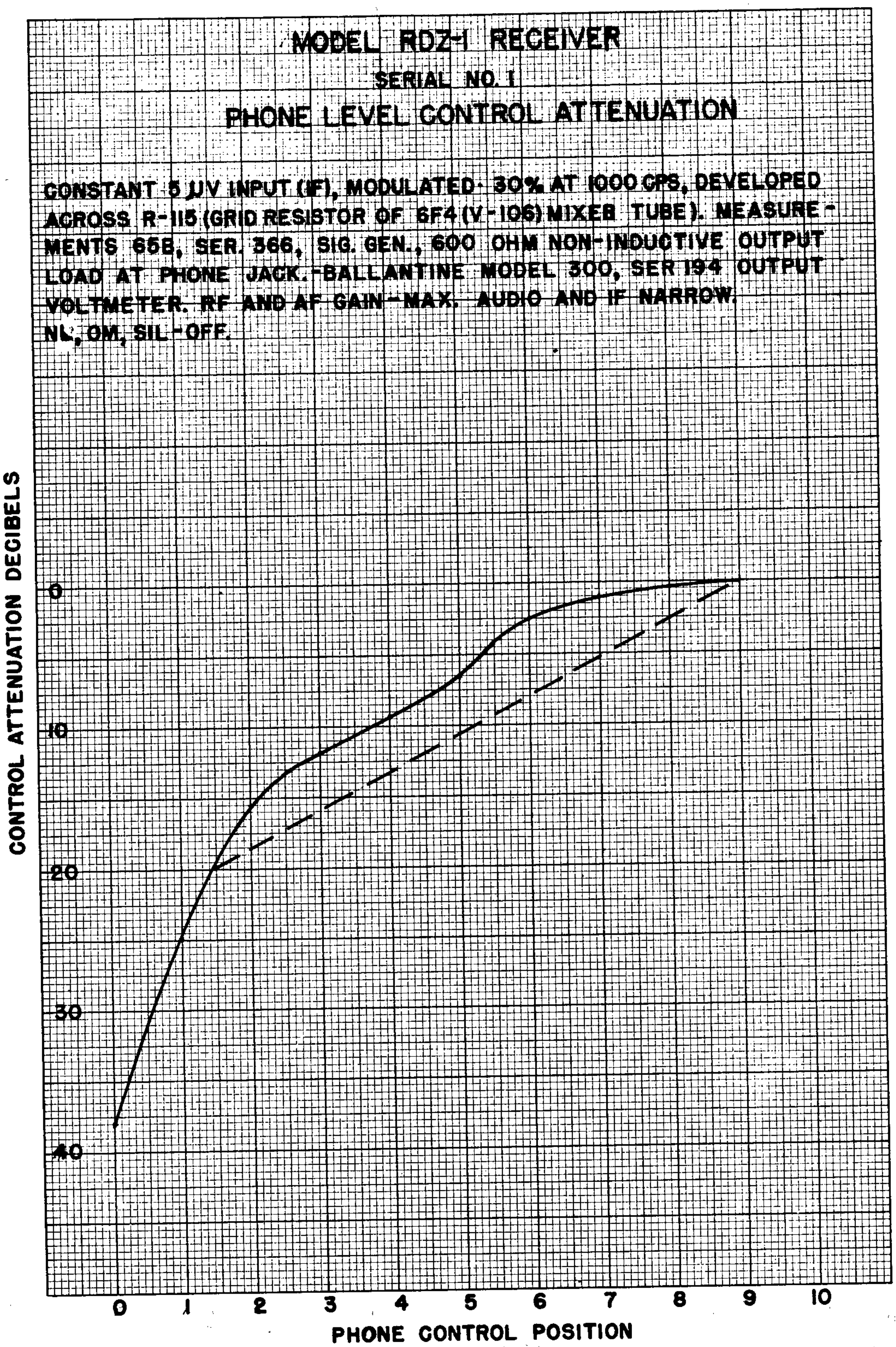


PLATE 22

RESTRICTED

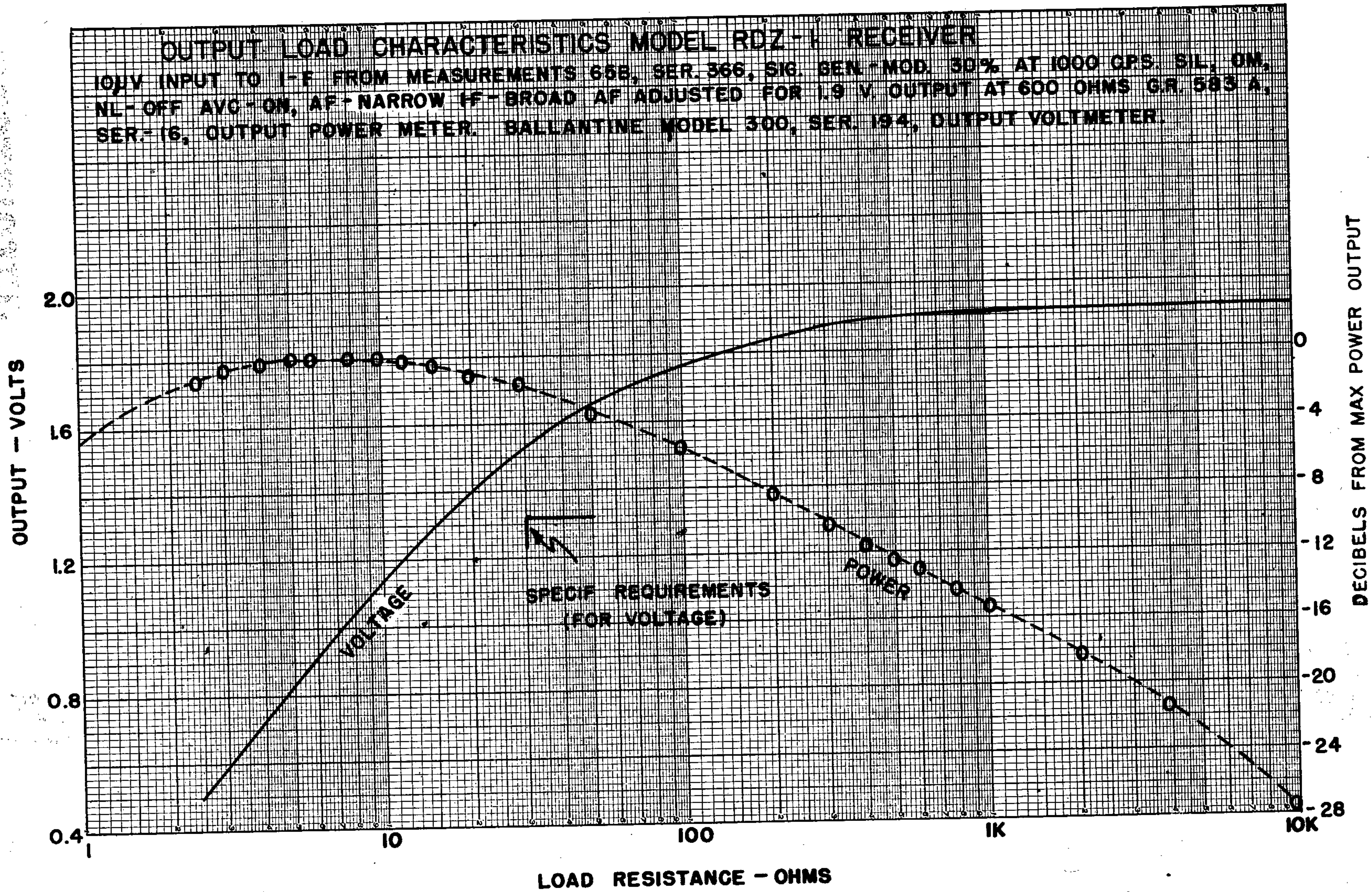
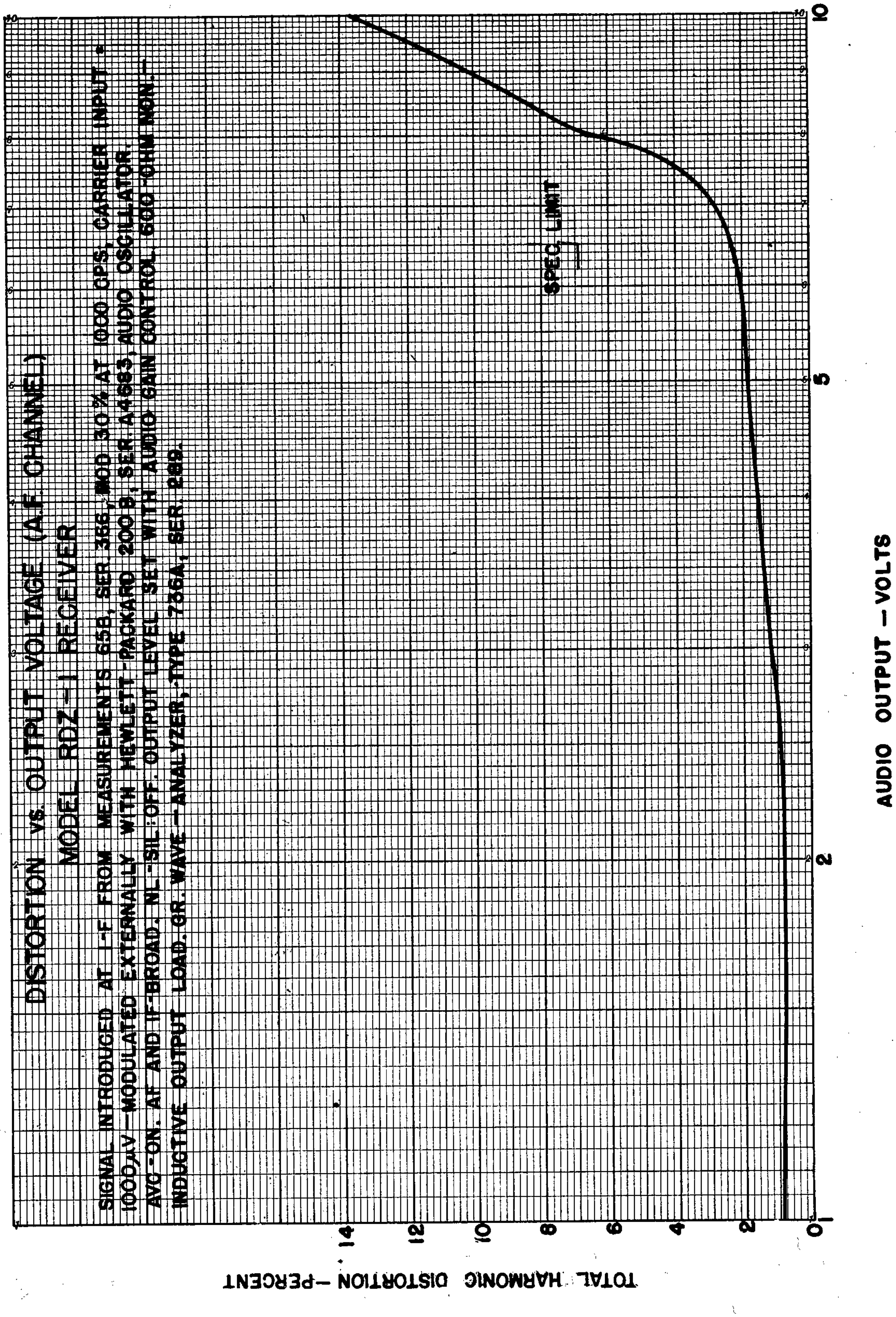


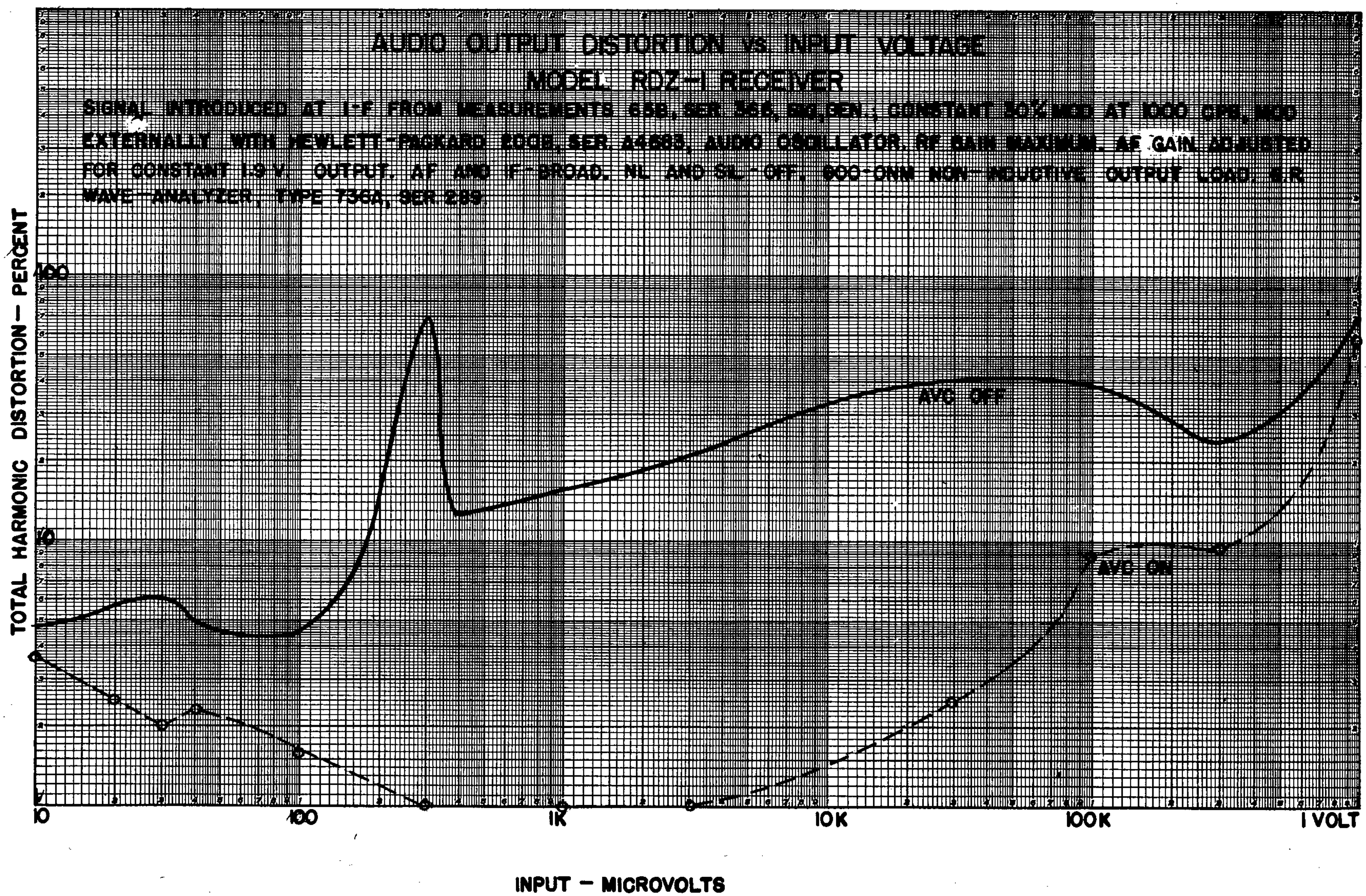
PLATE 23

RESTRICTED

UNCLASSIFIED

UNCLASSIFIED





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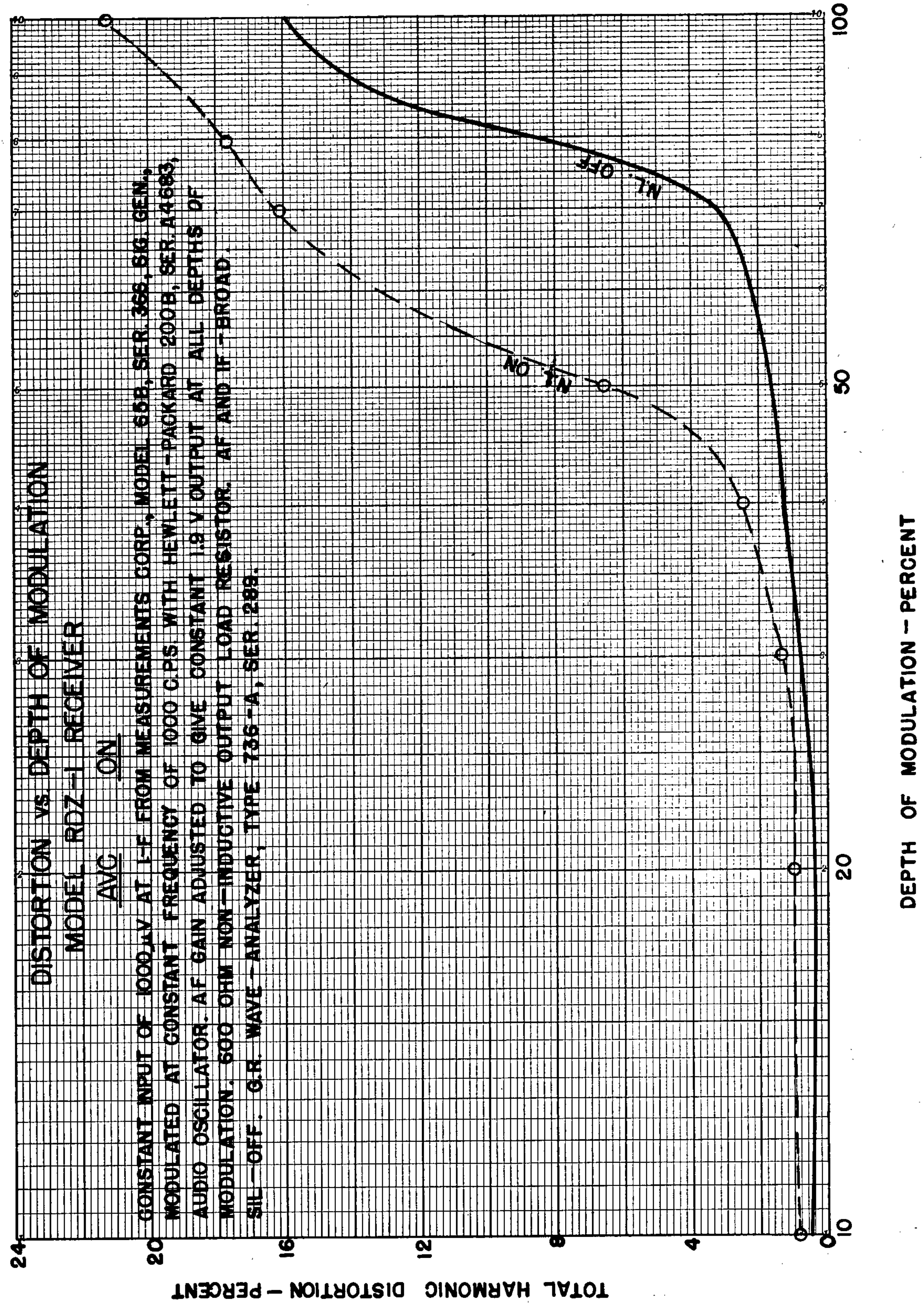

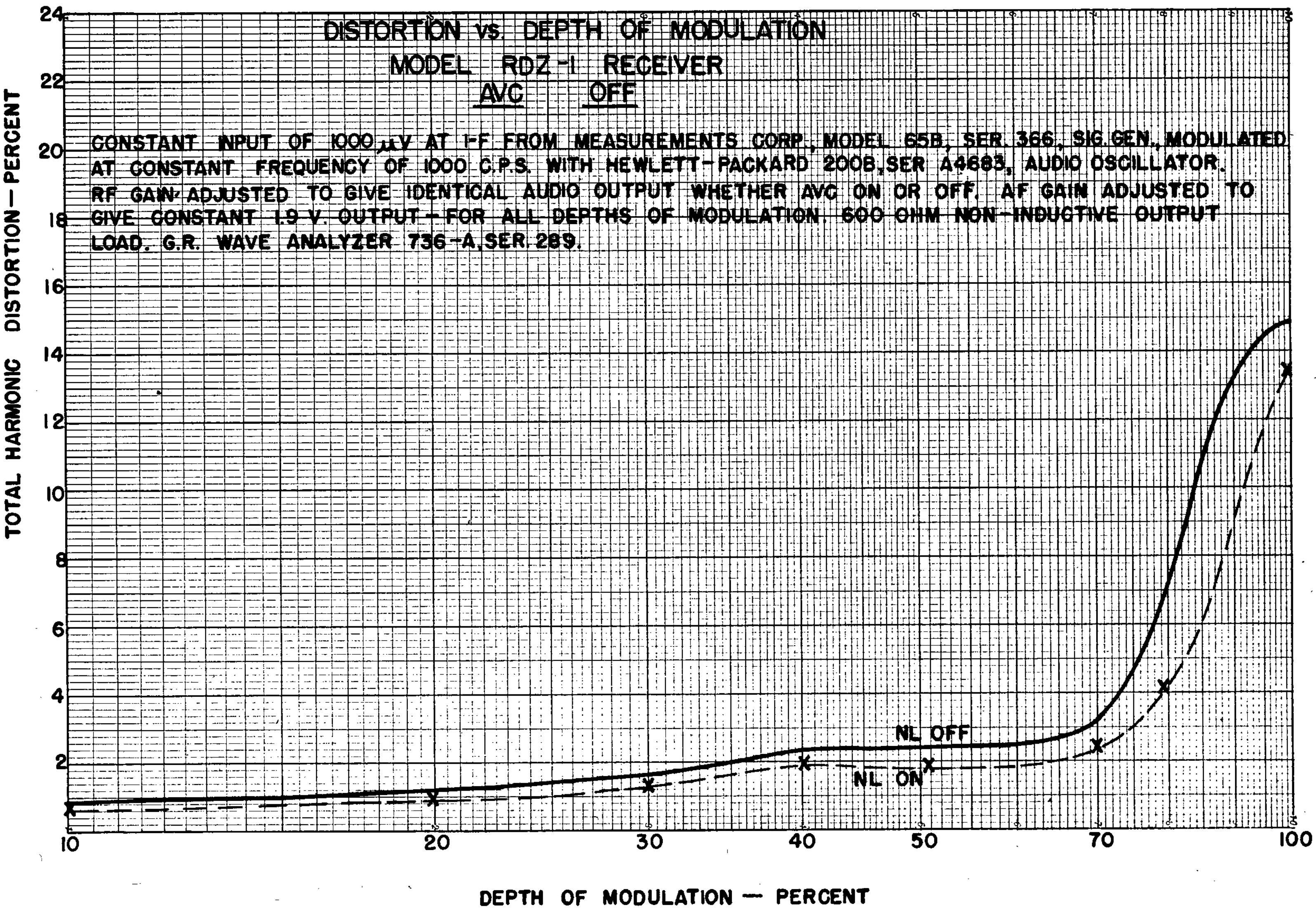

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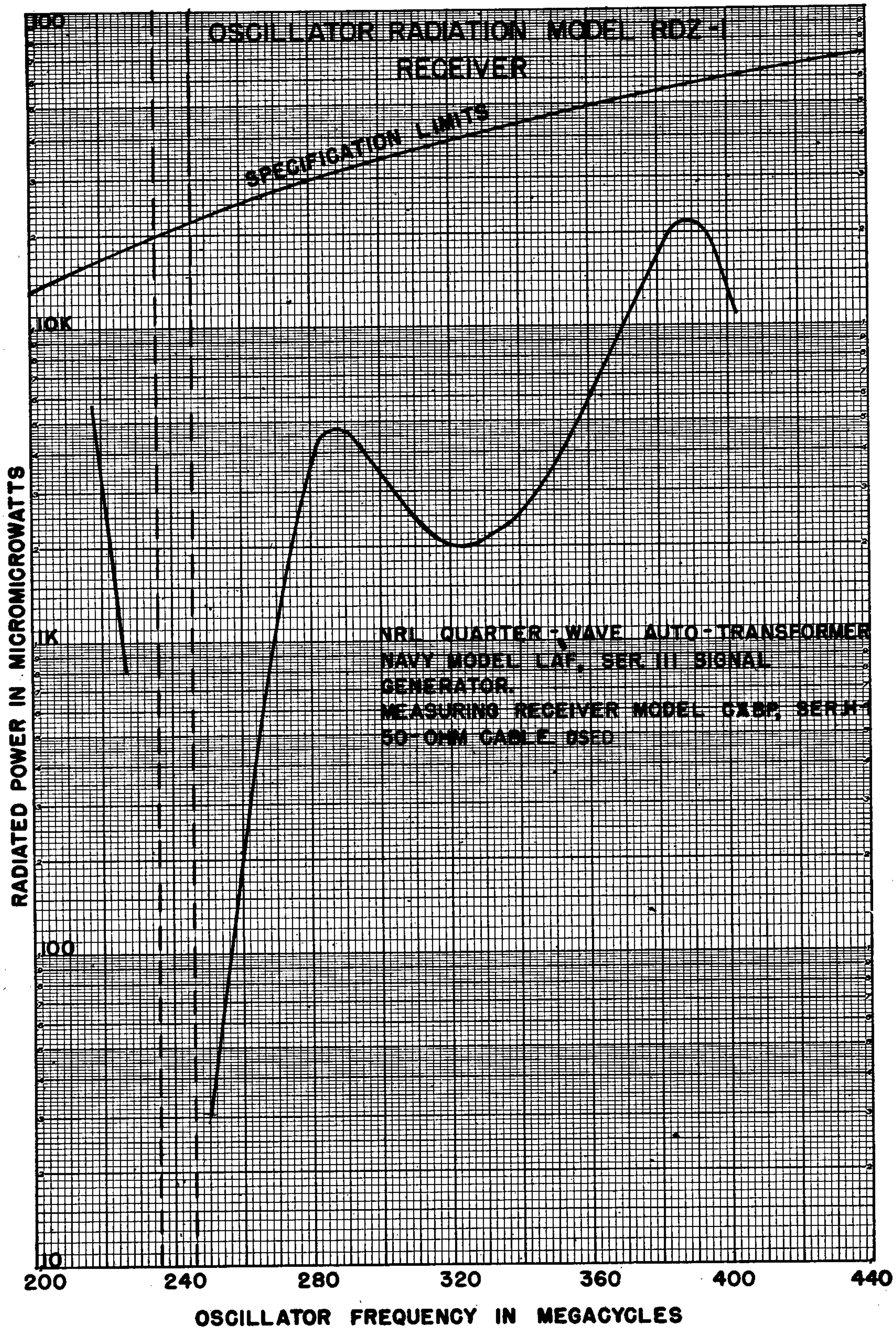

PLATE 28

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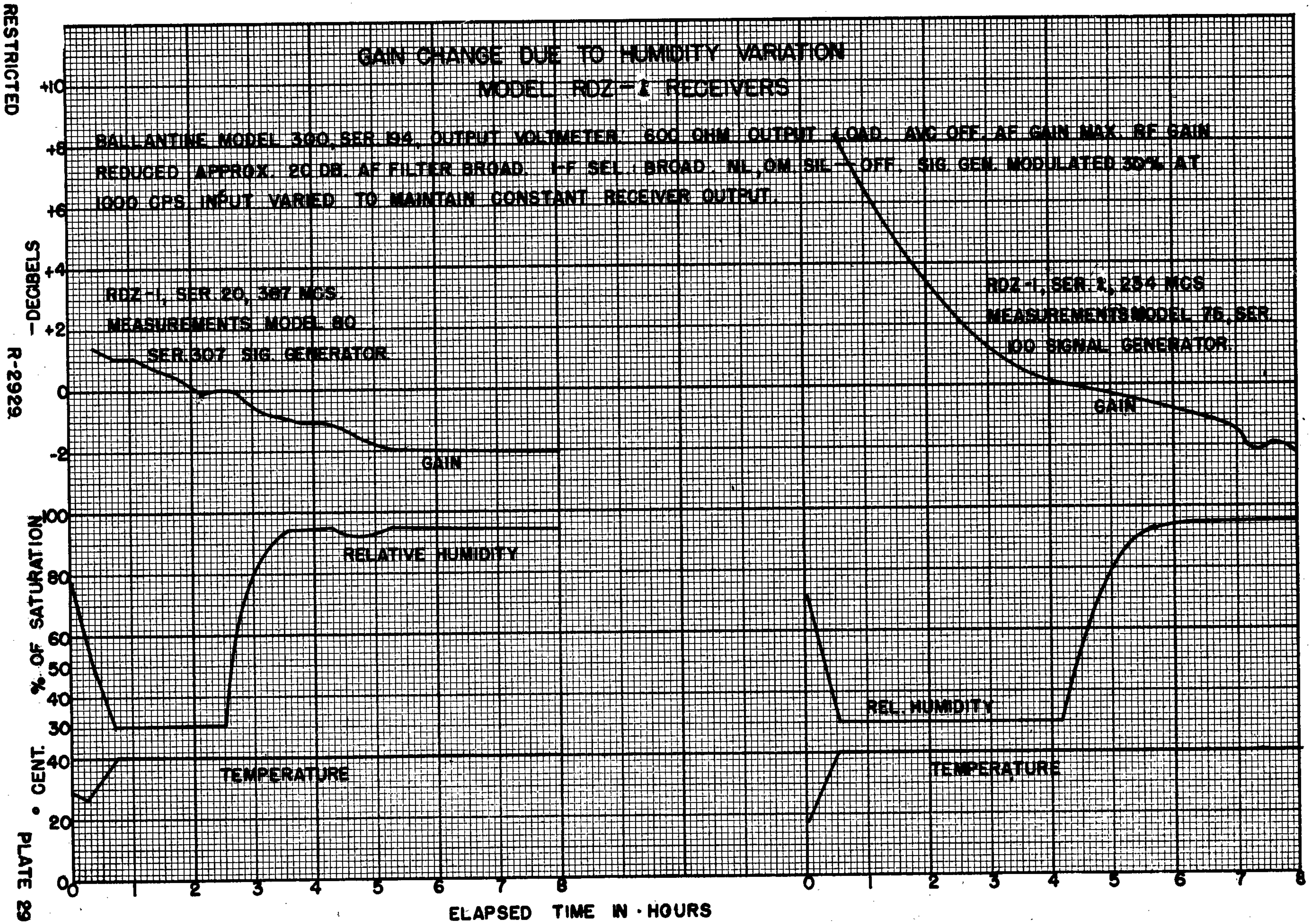

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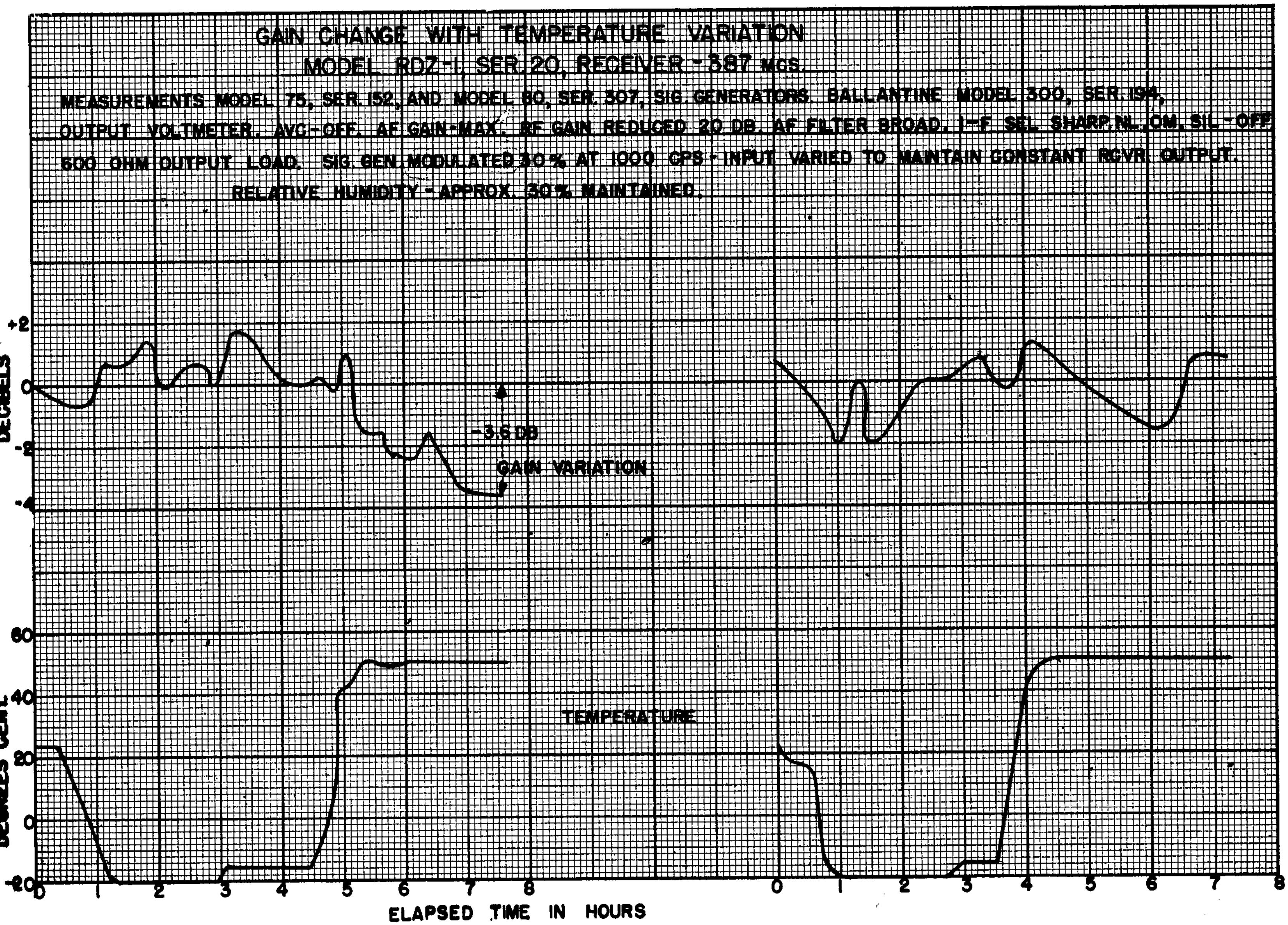

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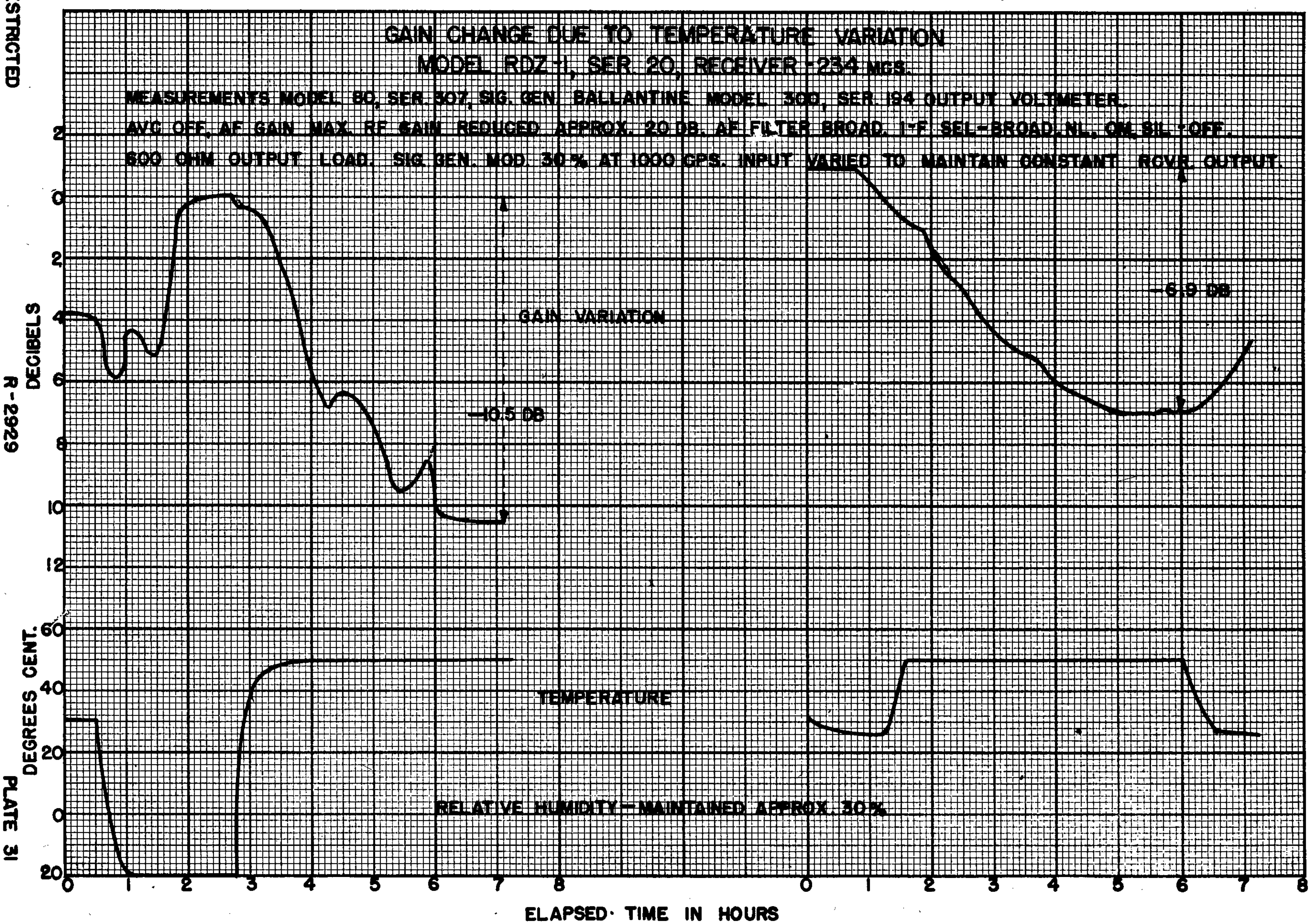

RESTRICTED

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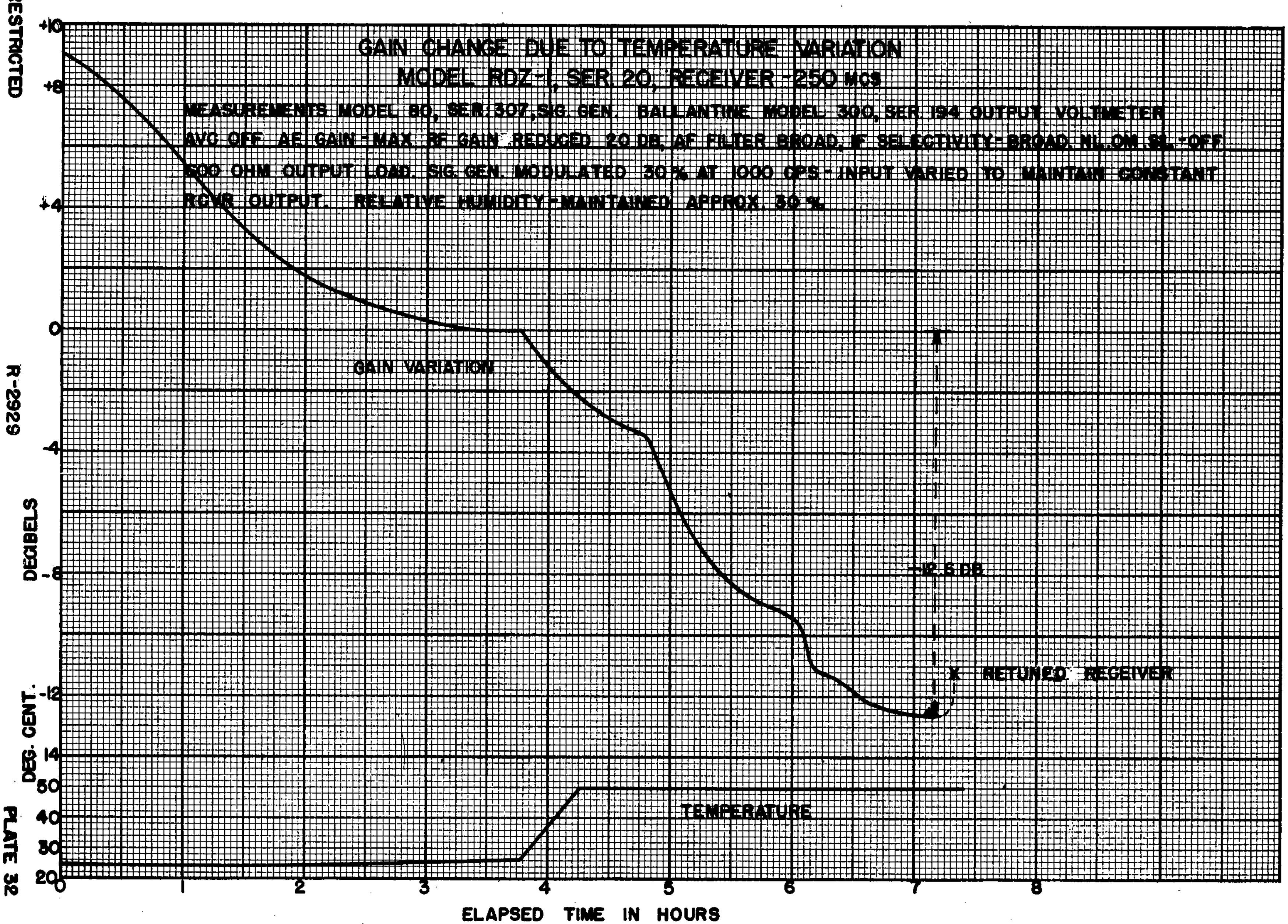
PLATE 31

UNCLASSIFIED


GAIN CHANGE DUE TO TEMPERATURE VARIATION
MODEL RDZ-1, SER. 20, RECEIVER - 250 MCS
MEASUREMENTS MODEL 80, SER. 307, SIG. GEN. BALLANTINE MODEL 300, SER. 194 OUTPUT VOLTMETER
AVC OFF AF GAIN - MAX RF GAIN REDUCED 20 DB, AF FILTER BROAD, IF SELECTIVITY - BROAD, NL OM SL - OFF
500 OHM OUTPUT LOAD. SIG. GEN. MODULATED 30% AT 1000 CPS - INPUT VARIED TO MAINTAIN CONSTANT
RCVR OUTPUT. RELATIVE HUMIDITY - MAINTAINED APPROX. 30 %
GAIN VARIATION
-12.5 DB
X RETUNED RECEIVER
TEMPERATURE
DECIBELS
DEG. CENT.
+10
+8
+4
0
-4
-8
-12
14
50
40
30
20
0
1
2
3
4
5
6
7
8
ELAPSED TIME IN HOURS

RESTRICTED

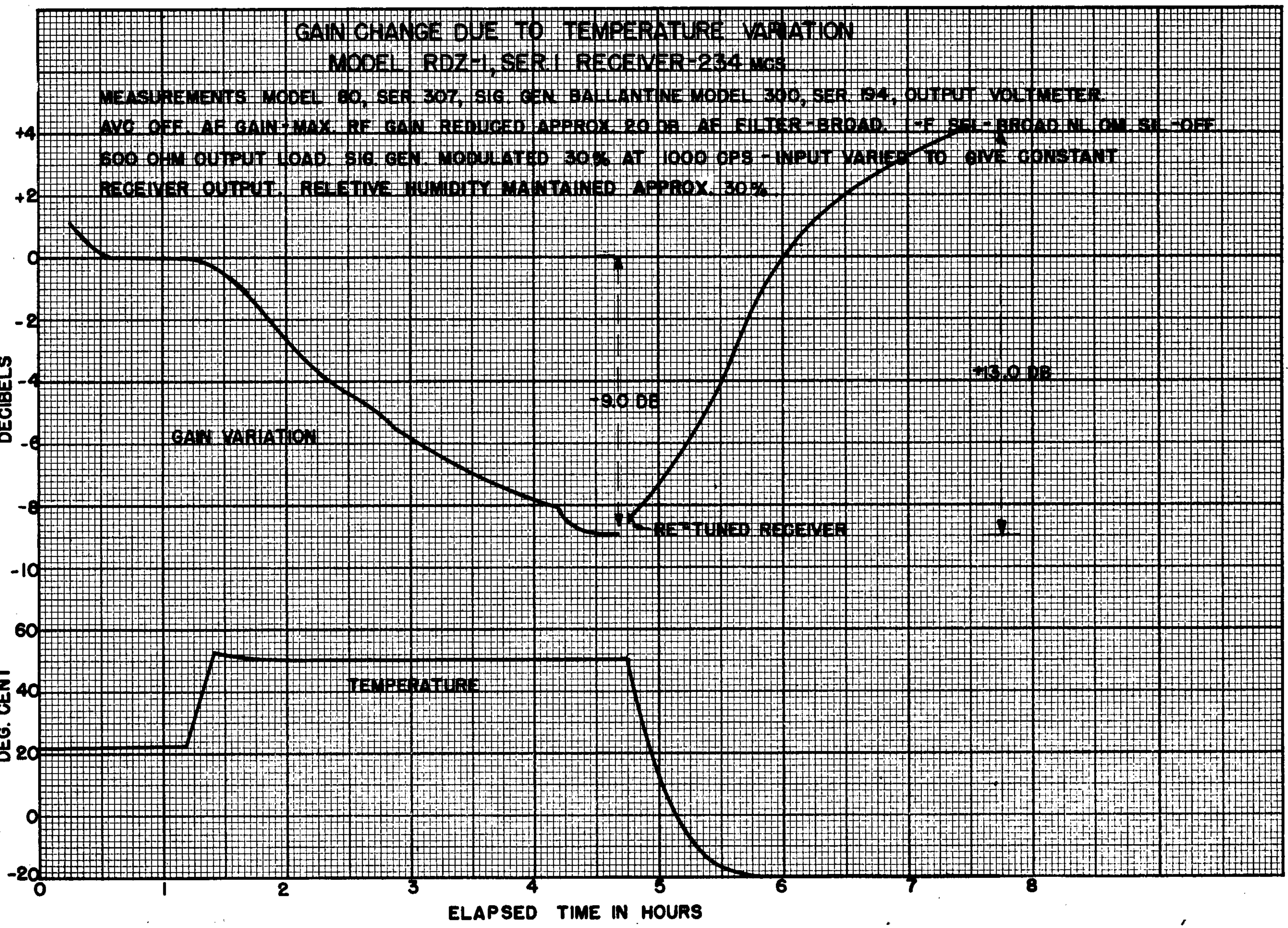


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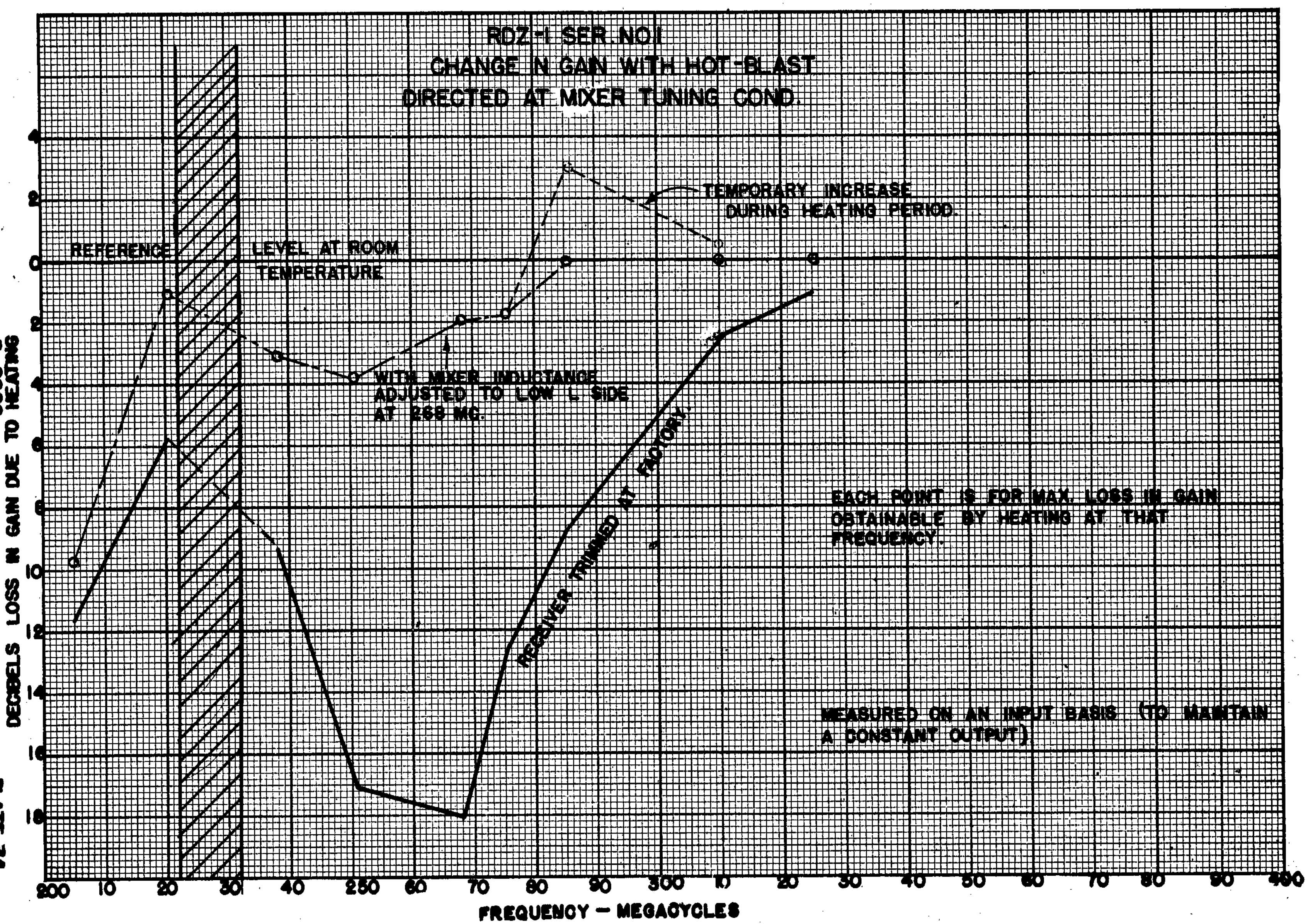
PLATE 33

UNCLASSIFIED

RESTRICTED



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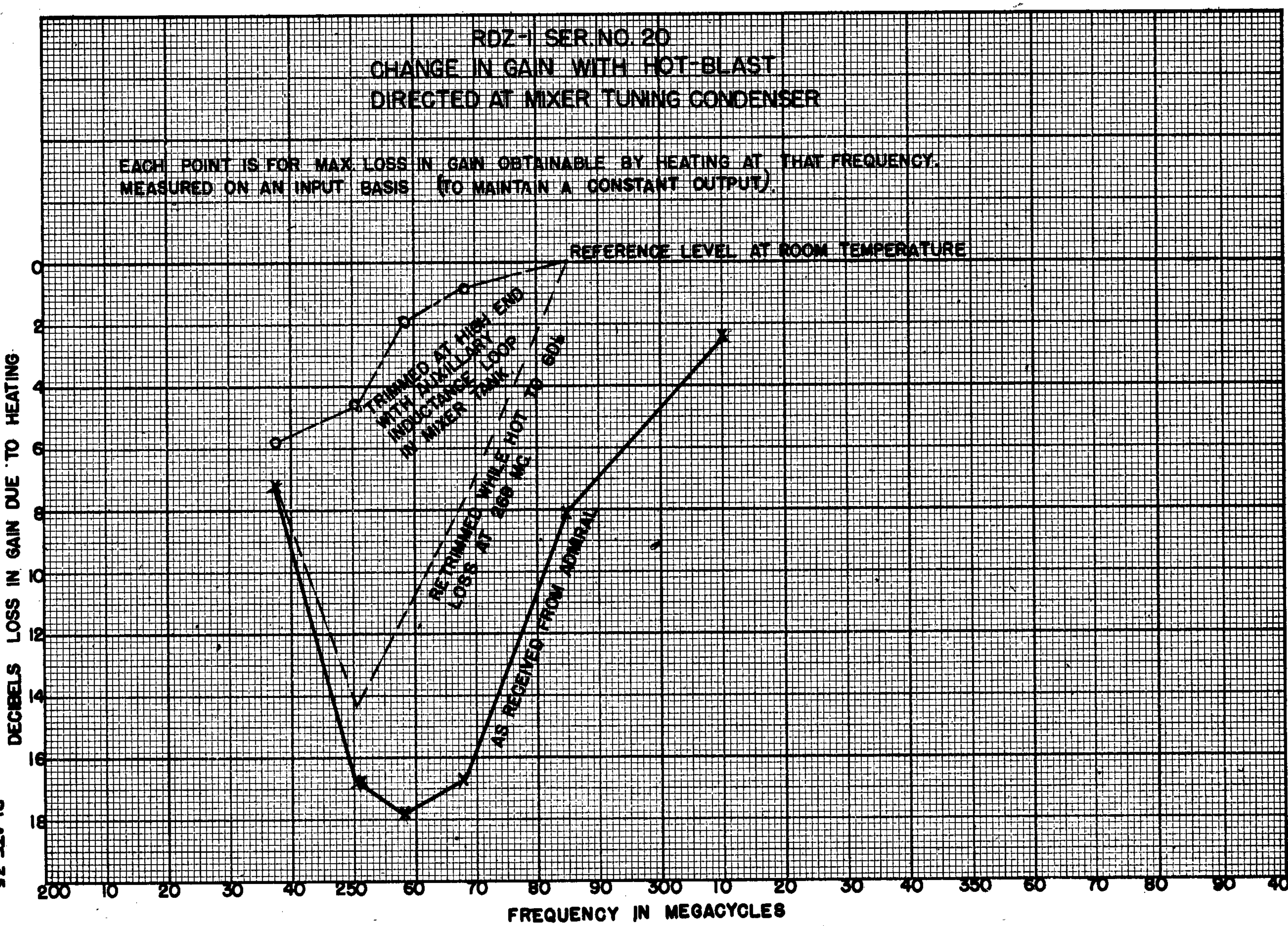
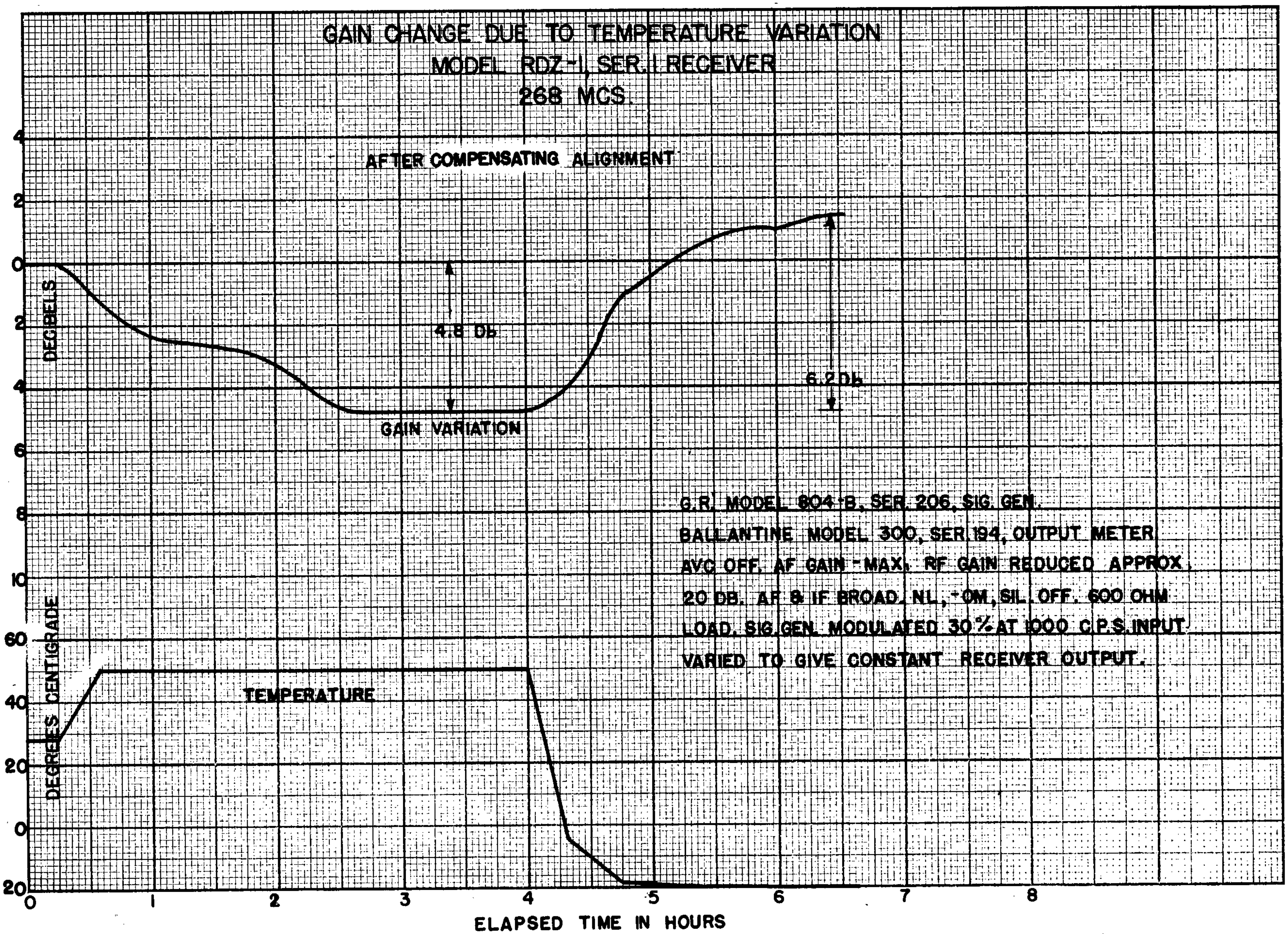
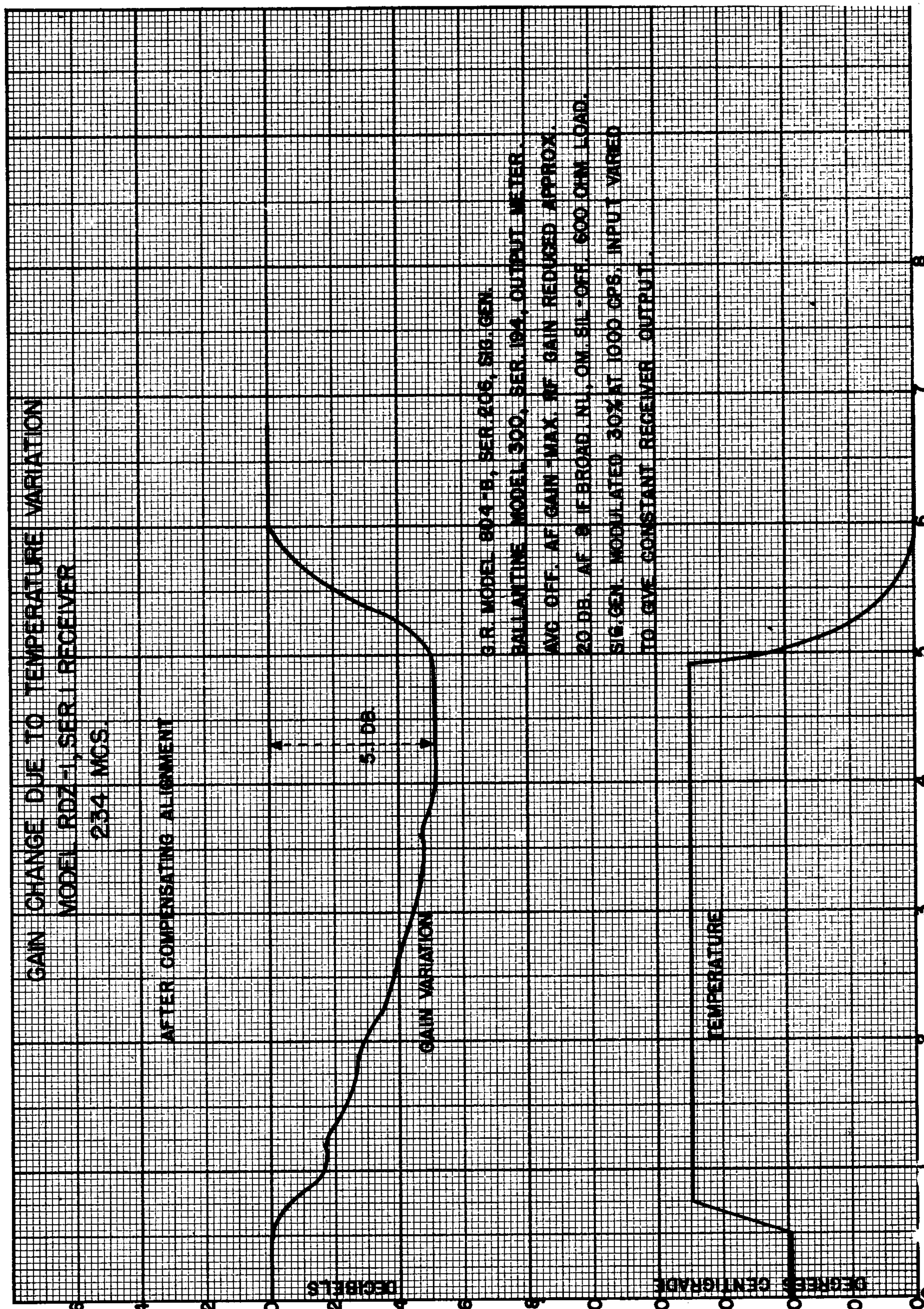

RDZ-1 SER. NO. 20
CHANGE IN GAIN WITH HOT-BLAST
DIRECTED AT MIXER TUNING CONDENSER
EACH POINT IS FOR MAX. LOSS IN GAIN OBTAINABLE BY HEATING AT THAT FREQUENCY.
MEASURED ON AN INPUT BASIS (TO MAINTAIN A CONSTANT OUTPUT).
REFERENCE LEVEL AT ROOM TEMPERATURE
TRIMMED AT HIGH END WITH AUXILIARY INDUCTANCE LOOP IN MIXER TANK
RETRIMMED WHILE HOT TO 6Db LOSS AT 268 MC
AS RECEIVED FROM ADMIRAL
DECIBELS LOSS IN GAIN DUE TO HEATING
FREQUENCY IN MEGACYCLES



UNCLASSIFIED

UNCLASSIFIED



UNCLASSIFIED

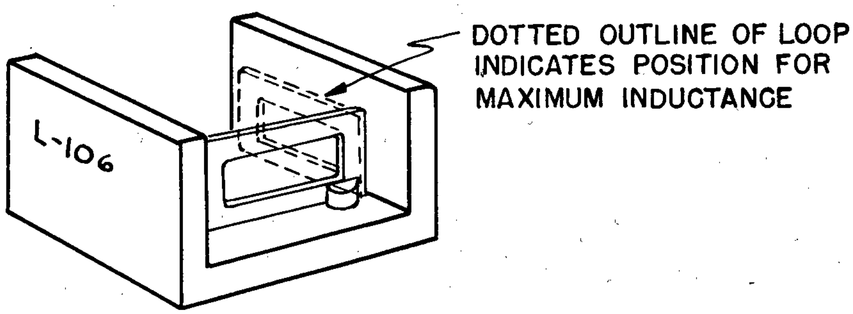


FIGURE I.
POSITION OF TRIMMER FOR
MINIMUM INDUCTANCE

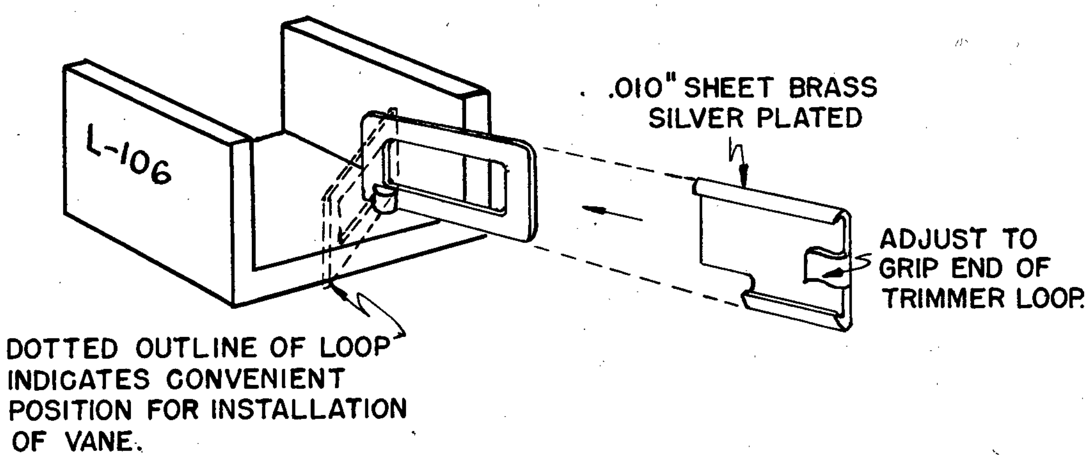


FIGURE 2.
CONSTRUCTION & METHOD OF
INSTALLATION OF ABSORPTION VANE

RDZ-RDZ-1

METHOD OF MODIFICATION OF MIXER
INDUCTANCE TRIMMER TO FURTHER REDUCE VALUE
OF THE INDUCTANCE